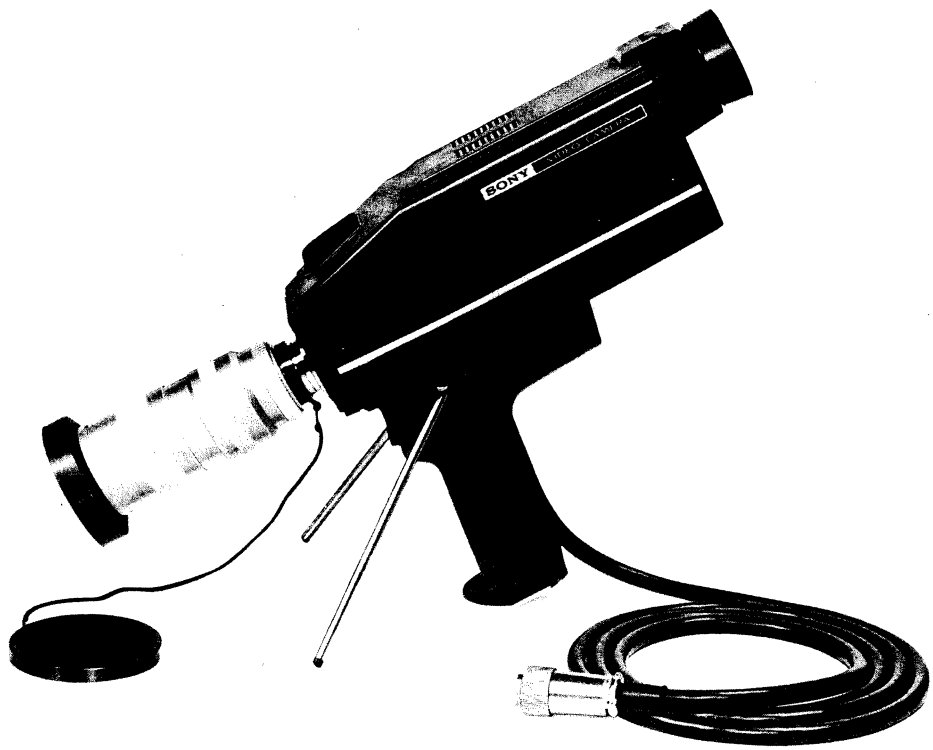
AVC-3450CE

PORTABLE B/W VIDEO CAMERA



SONY®

SERVICE MANUAL

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SECTION 1
GENERAL DESCRIPTION

1-1. INTRODUCTION

The SONY video camera, model AVC-3450CE, represents an outstanding engineering achievement. This camera is designed especially for use with the SONY portable videocorders such as AV-3420CE, and VO-3800P. However, it can be connected to any 1/2" SONY reel-to-reel type videocorders such as AV and CV series using the optional Camera Adaptor Model CMA-3CE.

The 2/3-inch-diameter electrostatic focus, magnetic-deflection vidicon type 20PE19 permits a package which is small and light. A built-in viewfinder employs a 1 1/2" picture tube to display the camera output directly. Camera operation is extremely simple: the operator need only aim the camera and adjust the optical focus. Automatic sensitivity control maintains a constant video output over a wide range of light levels.

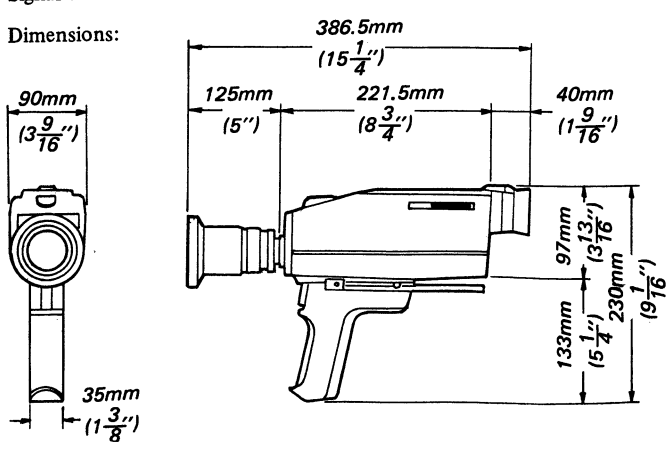
The camera employs a newly-developed Electret condenser microphone in which a special high-polymer film is used for the diaphragm. This permits a high sensitivity and high fidelity audio recording.

The operating temperature range is from −5°∼45°C.

1-2. SPECIFICATION

Power requirements:	12 ±1.2 Vdc (supplied from VTR)
Power consumption:	7 W
Operating temperature:	−5°∼45°C (23°F∼113°F)
Weight:	2 kg (4 lb 7 oz) (including lens)
Vidicon tube:	2/3-inch, electrostatic focus, electromagnetic deflection, type 20PE19
Scanning system:	625 lines 25 frames/sec
Sync system:	external
Horizontal frequency:	15,625 Hz
Vertical frequency:	50 Hz
Horizontal resolution:	More than 450 lines
Minimum illumination:	200 Lx (20 footcandles)
Automatic sensitivity control range:	300∼100,000 Lx (30∼10,000 footcandles)
Video output:	1.0 V(p-p), sync negative, 75-ohm, unbalanced
Signal-to-noise ratio:	More than 42 dB

Dimensions:



Accessories supplied:
1. Zoom lens (VCL-1206), F1.8 f 12.5∼75 mm
2. Hand strap
3. Instruction manual
4. Polishing cloth

Optional accessory: Camera cable : CCJ-1 (1.6 m), CCJ-5 (5.0 m), CCJ-10 (10 m)

1-3. OPERATION

(with SONY Portable Videocorder)

Step 1. Connect the end of the camera cable to the receptacle on the side of the videocorder. Lock the connector into place by tightening the locking collar on the cable connector.

Step 2. Set the CAMERA/TV switch on the videocorder to [CAMERA] .

Step 3. Set the function levers on the top of the videocorder to the REC and FWD positions simultaneously. You will hear the motor start. In a few moments the raster should appear on the screen of the monitor (behind the eyepiece).

Step 4. Remove the lens cap and point the camera at the subject. Adjust the zoom lever for the desired subject coverage and adjust the optical focus ring for a sharp picture.

Note: In most cases, set the lens opening to maximum (F1.8). Stop down the lens only when operating in bright outdoors or under studio-type lighting conditions. Make sure that the picture is satisfactory before actual recordings are started.

Step 5. Start the recording by pulling the start button or grip switch of the camera. A red light mounted behind the eyepiece lights to show the operator that the recording is in progress.

Step 6. The audio part of the recording can be monitored by plugging the earphone into the jack marked EARPHONE on the top of the videocorder.

Step 7. To stop the recording, pull the start button or grip switch again. Set the VTR function lever to STOP to shut off the system.

Note: Observe the following when operating the portable videocorder from storage batteries.

1. Monitor battery condition to make sure that the batteries are not excessively drained. The battery meter on the top of the videocorder shows battery conditions under load. Do not use the system when the meter reads in the red zone.
2. A drop in battery voltage below 11 volts will result in a loss of electrical focus in the viewfinder. This symptom signals low battery voltage. Do not continue to drain the batteries beyond this point as the ability of the batteries to be recharged will be impaired.

Step 8. To play back the tape, rewind the tape and set the VTR function lever to FWD. The playback picture can be seen on the AVC-3450CE Viewfinder.

(Operation with the CMA-3CE)

The CMA-3CE permits the AVC-3450CE camera to be operated with one of the dekcs in the AV and CV series. Attach the CMA-3CE to the videocorder as shown in the CMA-3CE operating instruction. Proceed as follows.

Step 1. Connect the end of the cable to the mating connector on the CMA-3CE.

Step 2. Plug the AC cord of the CMA-3CE into one of the AC outlets on the rear jackplate of the videocorder. Plug the mini jack into the MIC IN jack and plug the 6-pin connector into the CAMERA jack on the videocorder.

Step 3. Turn on the power switch on the CMA-3CE. Set the HD SELECT switch to (⌐╥⌐╥).

Step 4. The picture should appear in the screen of the viewfinder in a few moments.

Step 5. Follow the regular operating procedure for the deck to make the recording. (The red lamp in the viewfinder does not operate when the camera is used with the CMA-3CE).

OPERATING PRECAUTIONS

To protect the vidicon:

1. Avoid mechanical shock to the camera.
2. Do not carry the camera with the lens pointing downwards. In particular, avoid mechanical shock to the camera when the lens is pointing downwards.
3. Never point the camera at the sun or at another source of intense light. Keep the lens stopped down when shooting brightly illuminated scenes. Do not allow brightly illuminated scenes to remain stationary on the screen. Move the camera from side-to-side occasionally to keep images from being "burned in" at the target.

To protect the built-in microphone:

4. Do not keep the camera in an ambient temperature of over 60°C.
5. Keep the camera away from solvents, adhesives, and some plastics such as soft vinyl, vinyl acetate or other plastics containing plasticizers.

SECTION 2
CIRCUIT DESCRIPTION

2-1. GENERAL DESCRIPTION

The AVC-3450CE uses five printed circuit board. See Fig. 2-1.

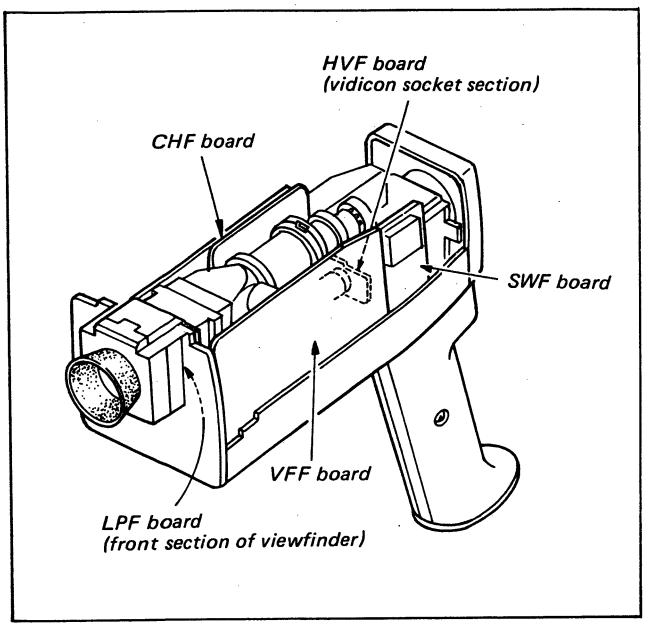


Fig. 2-1. Location of circuit board

The VFF board contains the vertical and horizontal deflection and high voltage circuits for the viewfinder.

The CHF board incorporates the video preamplifier, process amplifier, ASC, sync signal generator circuits, and the horizontal and vertical deflection circuits for the vidicon.

The SWF board produces the VTR remote control pulse.

The LPF board contains the Power pilot and Tally indicators. LED's are used for the indicators.

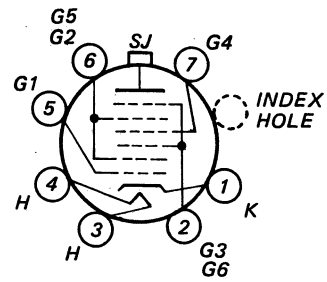
The vidicon socket is mounted or the HVF board and high operating voltages are applied to the pins of the socket from the VFF board.

2-2. VIDICON

The vidicon is widely used in closed circuit video cameras. The AVC-3450CE employs a newly-developed electrostatic focus, magnetic deflection vidicon (20PE19).

The conventional vidicon (magnetic focus, magnetic deflection type) has an external focus coil built into the deflection coil assembly. The dc current flowing through the focus coil forms the electron lens in the vidicon that focuses the electron beam on the target.

The electrostatic focus, magnetic deflection vidicon has electrodes within the vidicon itself that form the electron lens and the external focus coil is not necessary. The focus current for the focus circuit is eliminated and the power consumption for the camera is greatly reduced. The camera can be made more compact due to a smaller deflection coil.



Pin No.	Electrode	
1	K (cathode)	
2	G3, G6 (mesh)	520 V
3	H (heater)	6.3 V/95 mA
4	H (heater)	
5	G (beam)	−70 V to −35 Vdc
6	G2, G5 (accelerator) . . .	270 V
7	G4 (focus)	61 to 90 Vdc
SJ	Target	15 to 40 Vdc

Fig. 2-2. 20PE19 vidicon pin identification and electrode voltage

CHF BOARD

(PREAMPLIFIER) Q203, Q204

The video output signal from the vidicon is supplied to a video preamplifier consisting of Q203 and Q204. A low-noise FET (2SK43) is used for Q203 in order to improve the signal-to-noise ratio. Buffer Q204, directly connected to the drain (D) of Q203, supplies a low impedance video signal to Pin 24 of the following video process IC201 (CX-148).

(PROCESS AMPLIFIER) IC201, Q205

The video process IC201 contains the circuitry shown below.

Refer to Fig. 2-4. The output signal of the preamplifier is applied to Pin 24 of IC201 and is amplified by 30dB in the head amp circuit. The output signal appears at Pin 3. The pedestal level is adjusted by VR203. The output signal from Pin 3 is also supplied to the pedestal clamp circuit consisting of the circuits of Pins 6, 8, and 17. The signal is then supplied to the blanking mix circuit. At the same time, the output of Pin 3 is split into two paths. One path is a feedback circuit to the gate of the first FET consisting of R217, C213, C211, R216, and R211.

This sets the frequency characteristic of the video amplifier system. The blanking mix circuit mixes the clamped video signal and the blanking signal supplied from Pin 13 of IC202 (CX149). The mixed signal is supplied to the linear clip circuit. The linear clip circuit eliminates the noise in the pedestal level. Excessive white highlights in the video signal are eliminated in the white clip circuit. The sync mix circuit between Pins 10 and 13 adds sync signal to the video signal. The video signal output at Pin 10 is routed via buffer Q205 to Pin 1 of VTR connector (CN604) from Pin 10 as composite video signal. The composite video signal from the emitter of Q205 is supplied to the viewfinder for monitoring purposes via variable resistor VR205 (CONTRAST).

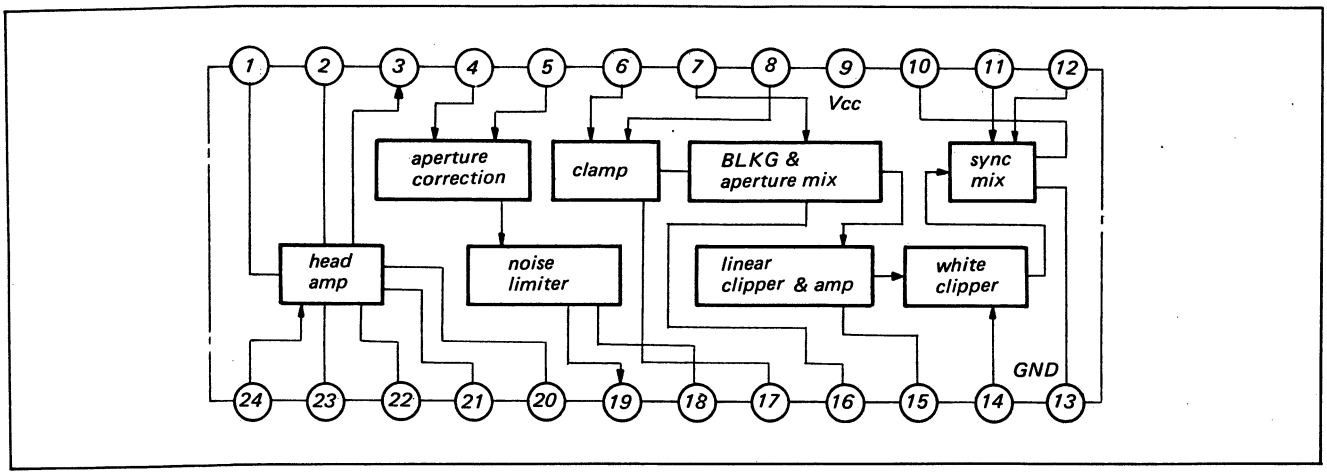


Fig. 2-3. Internal block diagram of CX-148

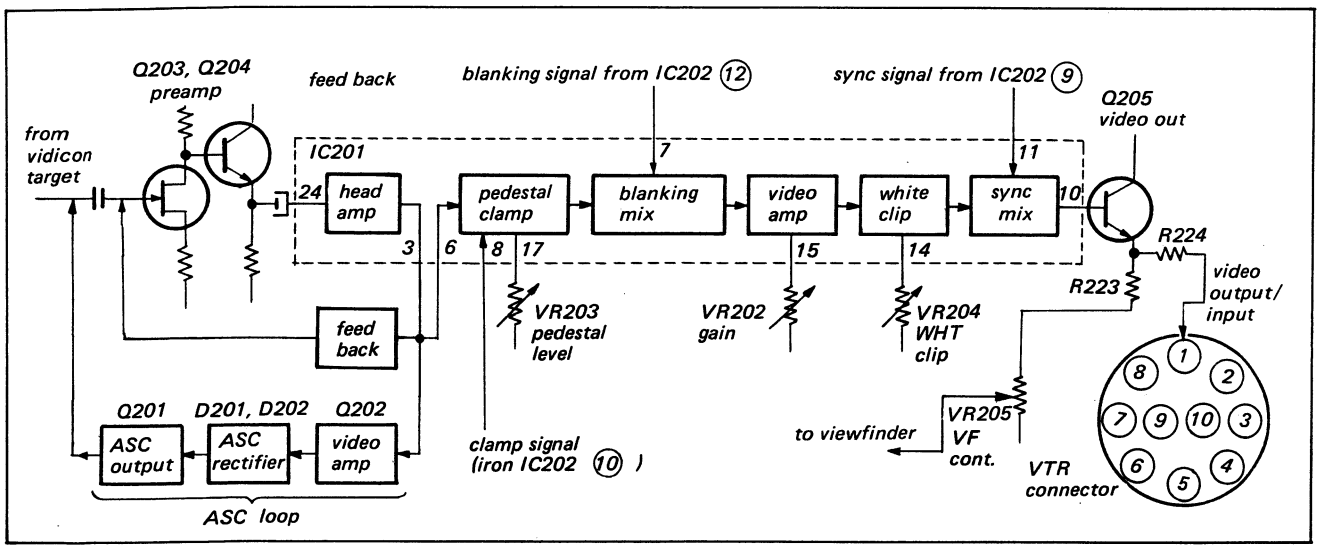


Fig. 2-4. Video system block diagram

(ASC CIRCUIT) Q201, Q202

Refer to Fig. 2-5. A portion of the video signal amplified in IC201 is supplied to the base of Q202. The output of Q202 is converted to a dc voltage proportional to the input signal from the rectifier circuit which consists of D201 and D202. Q201 inverts the dc voltage. The amplified dc voltage is supplied to the target of the vidicon. The target voltage will decrease for an excessive input signal and will increase for a small input signal. This circuit automatically varies in order to increase vidicon sensitivity to compensate for wide changes in scene illumination.

(HORIZONTAL OSCILLATOR CIRCUIT) Q208, Q209

The horizontal drive pulse (HD) from the VTR is supplied to the base of Q208 from Pin 5 of the VTR Connector, it is then amplified and supplied to the following horizontal blocking oscillator as a trigger signal. The free-running frequency of this blocking oscillator is dependant on the voltage supplied by VR207. It is normally set for a frequency lower than that of the horizontal drive pulse. If an external drive pulse is supplied, the oscillator will lock to the frequency of the pulse. See Fig. 2-6.

(HORIZONTAL AND VERTICAL DEFLECTION CIRCUITS) IC202

IC202 is used to produce the horizontal and vertical deflection signals and contains the circuitry to produce sync and blanking pulses as shown in Fig. 2-7.

(SAWTOOTH WAVE GENERATOR) Q210, Q211

The vertical drive signal from Pin 13 of IC202 is applied to the base of Q211. Q211 is normally off but when the VD signal is applied to its base, Q211 turns on for the pulse period and discharges C231. When the pulse disappears, Q211 turns off, C231 starts to charge and a charge current appears across it. This current is used as the vertical deflection signal. In many sawtooth generator circuits, a resistor is employed instead of Q210. This kind of CR type generator does not have good linearity because the resistor can not provide a constant current. In the AVC-3450CE, a transistor is used in place of the resistor to produce the sawtooth wave form with good linearity. See Fig. 2-8.

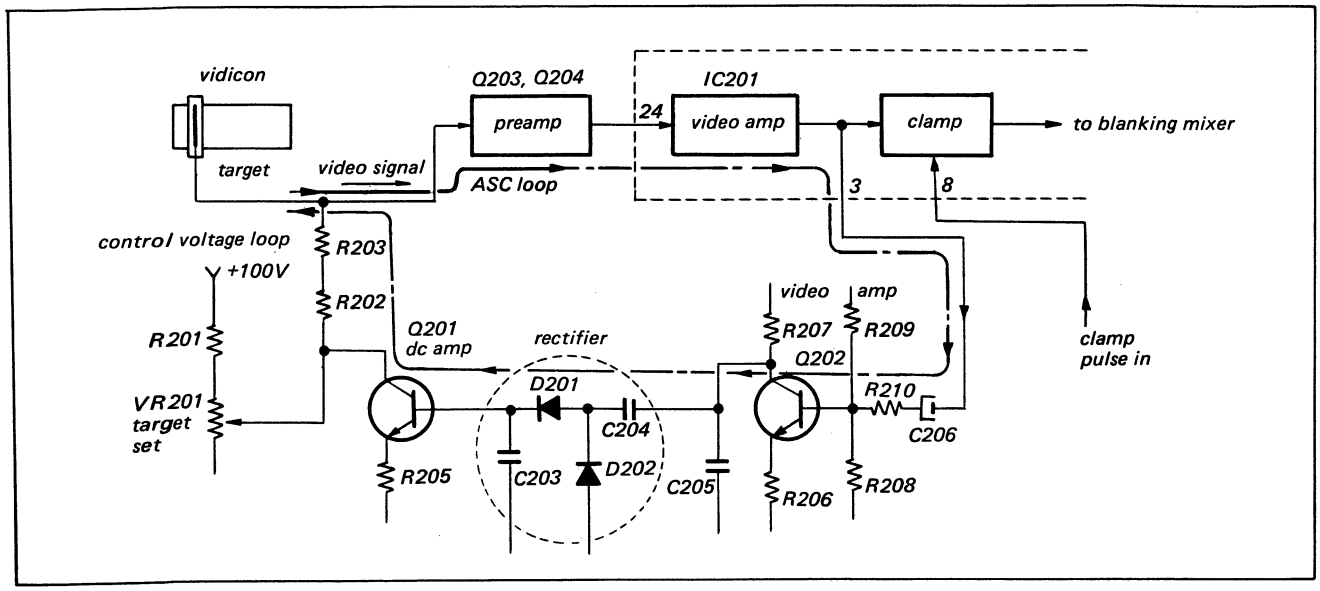


Fig. 2-5. ASC circuit

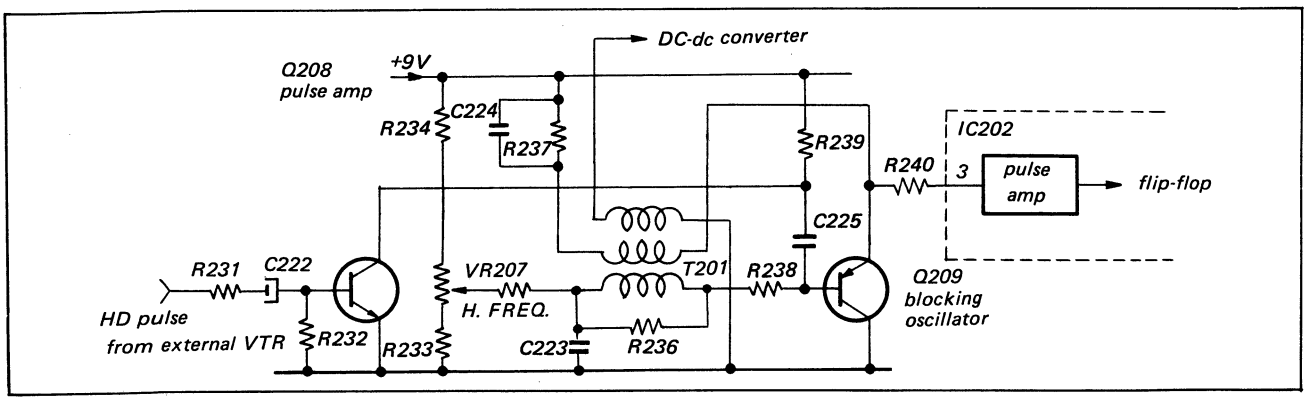


Fig. 2-6. Horizontal oscillator circuit

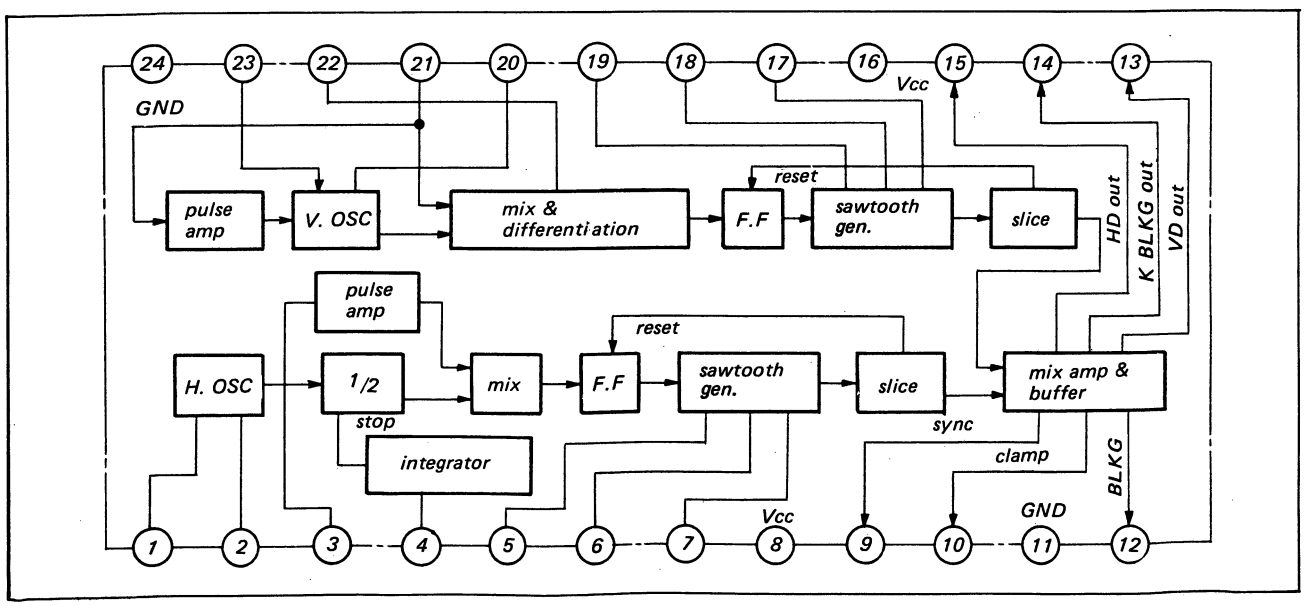


Fig. 2-7. Internal block diagram of CX-149

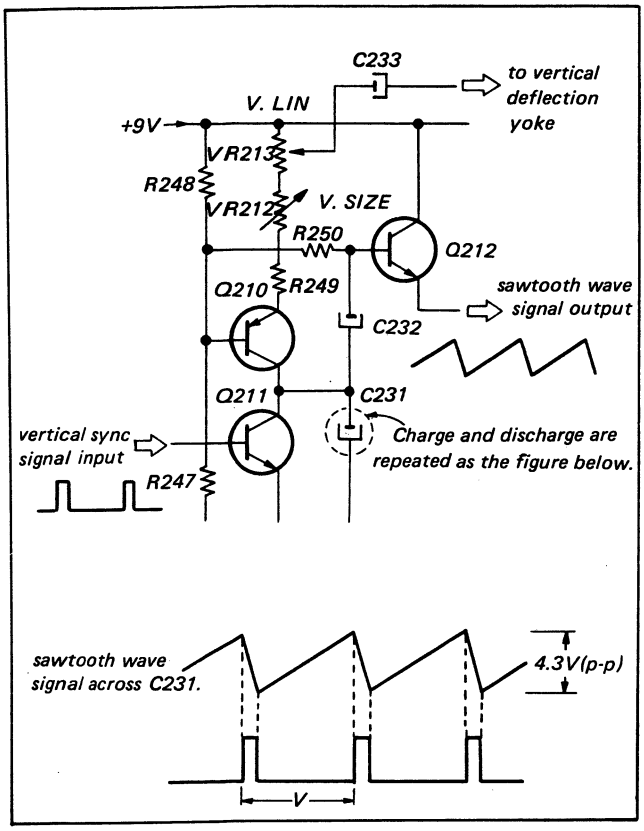


Fig. 2-8. Sawtooth wave generator circuit

(HORIZONTAL OUTPUT CIRCUIT) Q215, Q216

Q215 and Q216 form the horizontal drive and horizontal output circuits. The circuits amplify the HD signal supplied from Pin 15 of IC202 and supply it to the vidicon deflection coil and dc-to-dc convertor.

(REGULATOR CIRCUIT) Q206, Q207

+12 V is supplied to Pin 10 of the VTR connector from the VTR. It is regulated to +9 V by Q206 and Q207. The +9 V is adjusted by VR206 and supplied as B+ voltage to each board.

VFF BOARD

(VIEWFINDER HORIZONTAL OUTPUT CIRCUIT) Q101, Q102

The horizontal output circuitry consists of the horizontal drive, horizontal output and high tension circuits. The horizontal drive circuit amplifies the horizontal pulse supplied from the CHF board and supplies the base current for the output stage. The horizontal output circuit supplies sawtooth current to the deflection coil.

Refer to Fig. 2-9. Q101 amplifies the horizontal pulse from the CHF board to drive Q102. The deflection coil (as shown in the figure) provides the inductance to form a tuned circuit. To produce the deflection sawtooth current flow through the deflection coil, it is necessary to turn the voltage supplied to the deflection coil on and off. Q102 and D101 in the horizontal output stage, working with the base current of Q102, act as a switch to accomplish this.

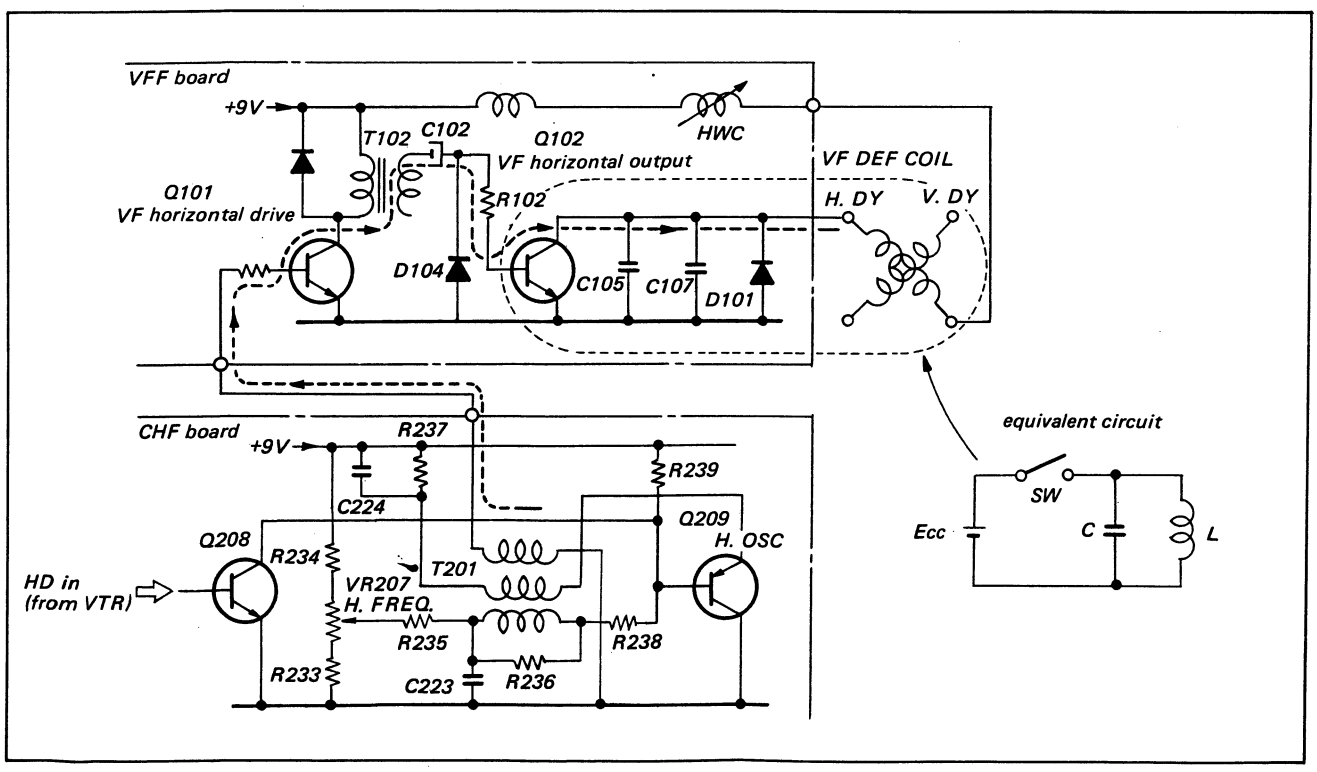


Fig. 2-9. Viewfinder horizontal output circuit

(VIEWFINDER VIDEO OUTPUT CIRCUIT) Q103

A sample of the video signal of the CHF board is level-adjusted by VR205 and supplied to the base of Q103 from Q205. The blanking signal is supplied to the emitter of Q103 from Pin 12 of IC202 on the CHF board. Q103 mixes and amplifies the video signal and the blanking signal. Its output is supplied to the cathode of the CRT of the viewfinder.

(DC-to-DC CONVERTER CIRCUIT) Q104, Q105

Q104 and Q105 form a collector tuned oscillator that is connected to the primary of the step-up transformer. This oscillator's free-running frequency is about 6 kHz when there is no trigger input. When the trigger input (HD) is applied, it is switched and a trapezoidal-like wave appears at the collector (see Fig. 2-10). A voltage (which is determined by the winding ratio) is generated in the secondary of the transformer. The generated voltage is rectified and supplied to the vidicon and CRT of the viewfinder.

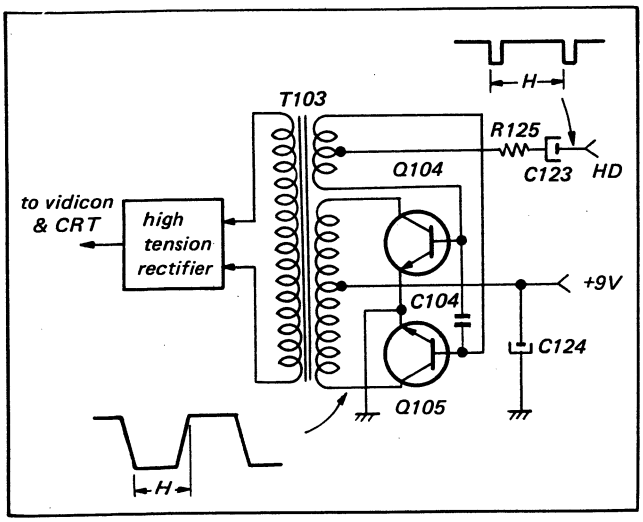


Fig. 2-10. DC-to-DC converter

(CATHODE BLANKING CIRCUIT) Q106

Q106 amplifies the cathode blanking signal from Pin 14 of IC202 on the CHF board and supplies it to the cathode of the vidicon.

(VIEWFINDER VERTICAL SAWTOOTH GENERATOR CIRCUIT) Q107, Q108

The VD signal from Pin 13 of IC202 of the CHF board is applied to the base of Q107. Q107 and Q108 are connected in a high input impedance Darlington connection, and amplify the vertical sync signal (VD) to a sufficient level. VR105 and VR106, in the collector circuit of Q108, adjust the vertical amplitude and vertical linearity of the viewfinder.

(VIEWFINDER VERTICAL OUTPUT CIRCUIT) IC101

An audio IC (TA-7093P) is used in the VF vertical output circuit to amplify the pulse which drives the VF deflection coil.

SWF BOARD

The SWF board produces the signal for remote control of the VTR when the AVC-3450CE is connected to a portable VTR (such as AV-3420CE, and VO-3800P).

When the trigger of the camera is pulled, a dc drive current is supplied to the VTR. The current flows to a solenoid in the VTR and the VTR is set to the record mode.

(VTR START PULSE GENERATOR CIRCUIT) IC301, Q301, Q302

When the trigger switch is pulled on, the VTR starts the recording operation and the lamp (LED D501/LPF board) in the viewfinder hood lights. See Fig. 2-12 Before the trigger switch is pulled, Pin 9 of IC301 is low, Pin 13 is high and Pin 8 is kept high.

When the trigger switch is pulled, Pin 9 is high, Pin 13 is low, and Pin 8 is low. The ON-OFF pulse is supplied to Pins 5, and 1 of IC301. The circuit between Pins 1 and 6 is a flip-flop. When the trigger switch is off, i. e. Pin 8 is at a high level, the output terminal of flip-flop Pin 6 is at a low level. Pin 6 is stabilized at a low level by R304 connected to ground. When the trigger switch is pulled, Pin 8 goes to a low level, Pin 6 of the flip-flop goes to a high level and Q301 turns on. A current flow in the emitter-collector of Q302 lights lamp D501, the control signal is supplied to Pin 6 of connector CN604 to the VTR, and the record mode is set up.

If the trigger switch is pulled again, the control signal to the VTR is interrupted and the VTR is set to the pause mode.

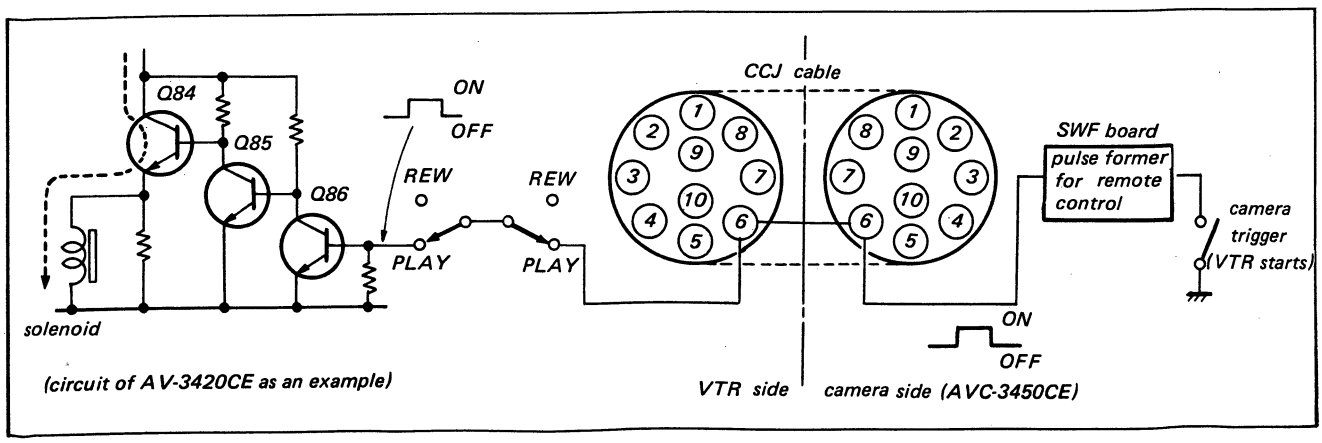


Fig. 2-11.

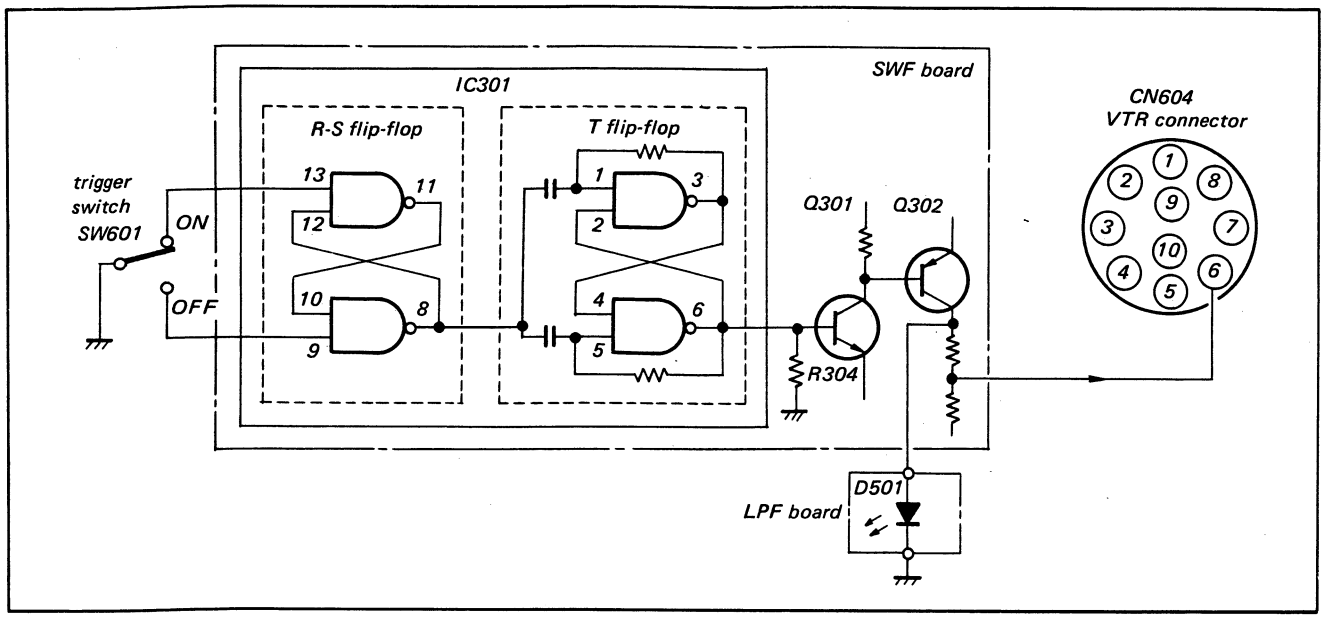

SWF board
IC301
R-S flip-flop
T flip-flop
trigger
switch
SW601
ON
OFF
13
11
12
10
8
9
1
3
2
4
6
5
Q301
Q302
R304
CN604
VTR connector
1
2
8
9
3
7
10
4
6
5
D501
LPF board

Fig. 2-12.

SECTION 3
DISASSEMBLY

3-1. TOP COVER REMOVAL

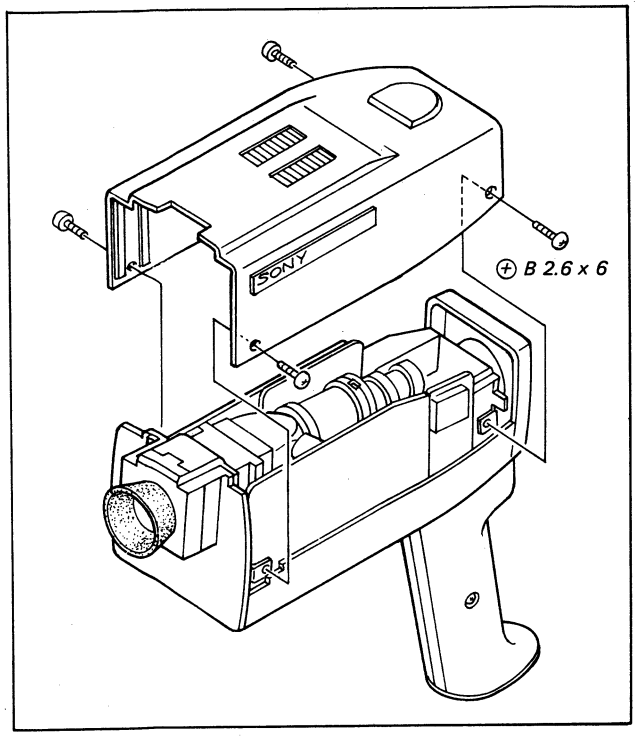


Fig. 3-1. Top cover removal

3-2. BOTTOM COVER REMOVAL

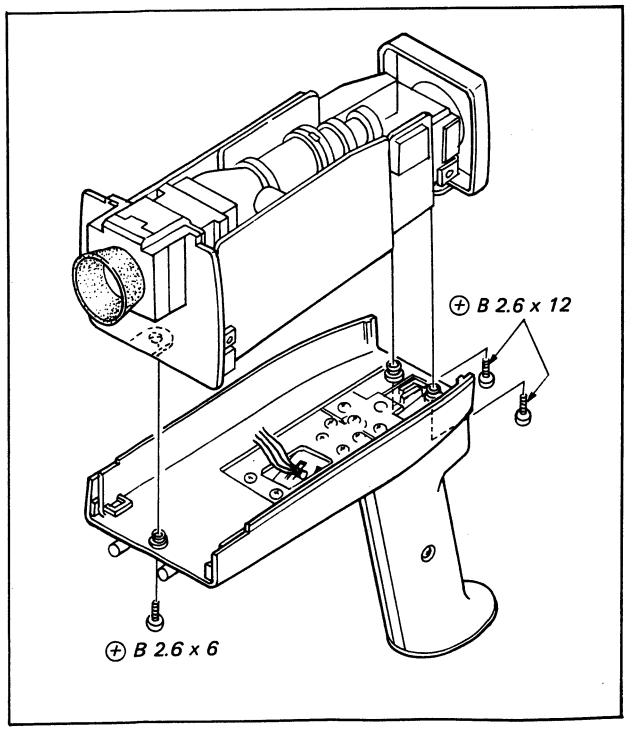


Fig. 3-2. Bottom cover removal

3-3. GRIP REMOVAL

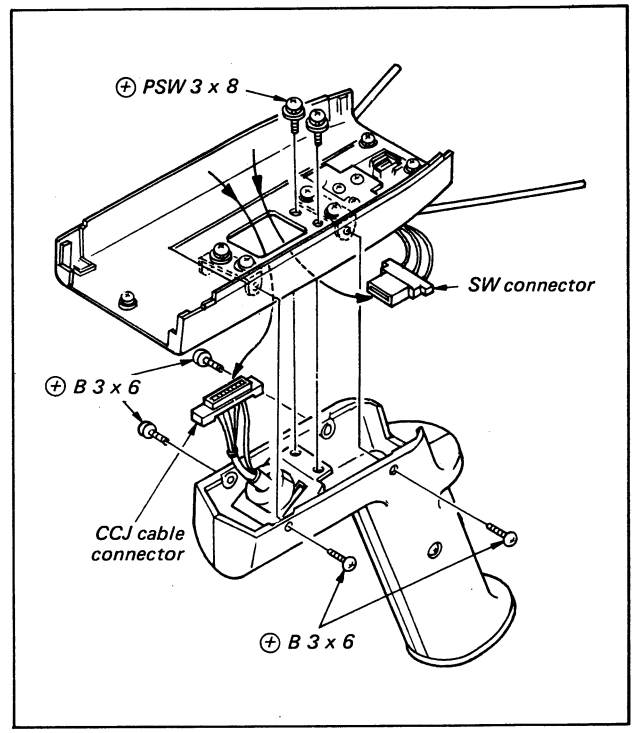


Fig. 3-3. Grip removal

3-4. GRIP ASS'Y DISASSEMBLY

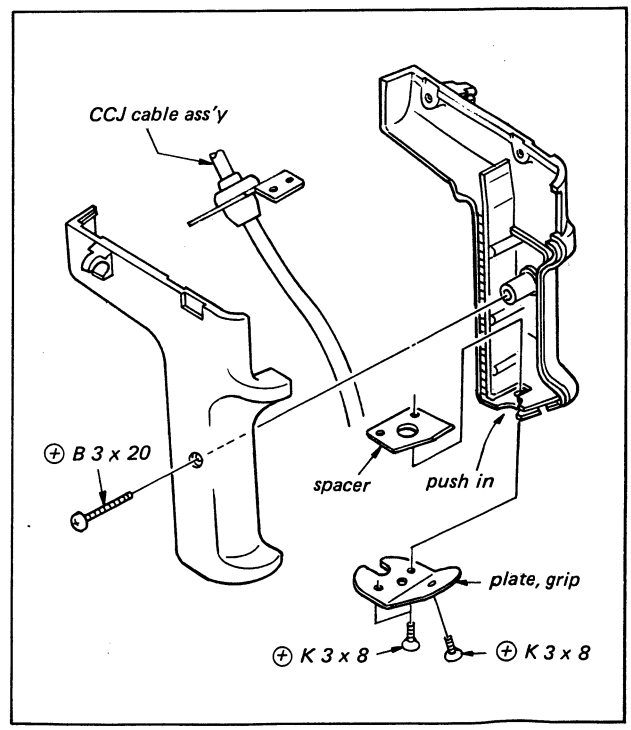


Fig. 3-4. Grip Ass'y disassembly

3-5. FRONT PANEL REMOVAL

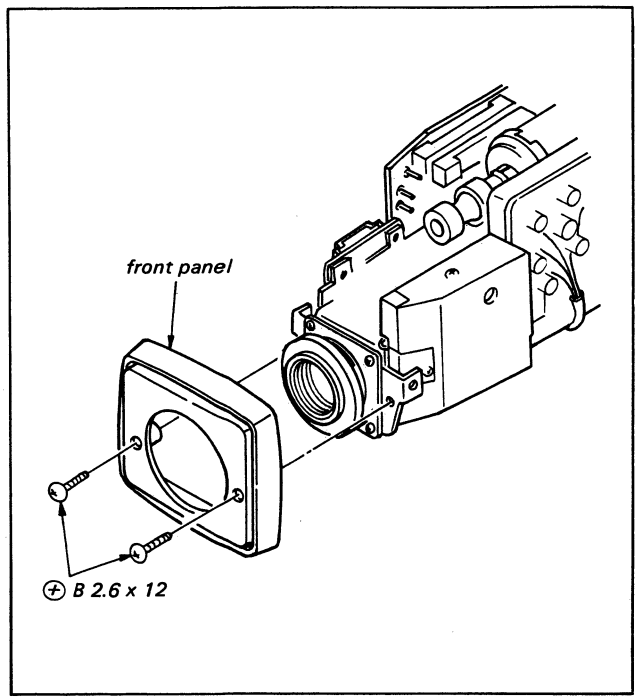


Fig. 3-5. Front panel removal

3-6. PRE-AMP SHIELD PLATE REMOVAL

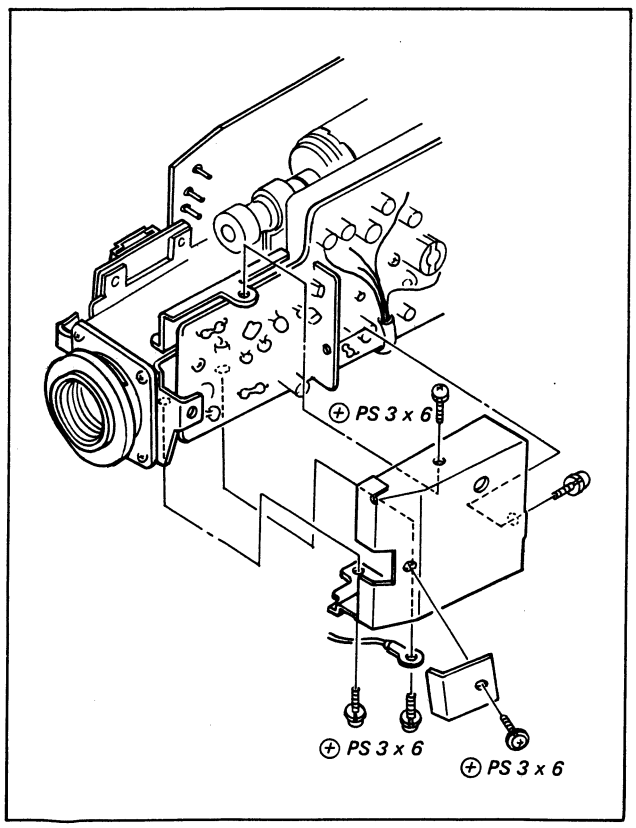


Fig. 3-6. Pre-amp shield plate removal

3-7. REAR PANEL REMOVAL

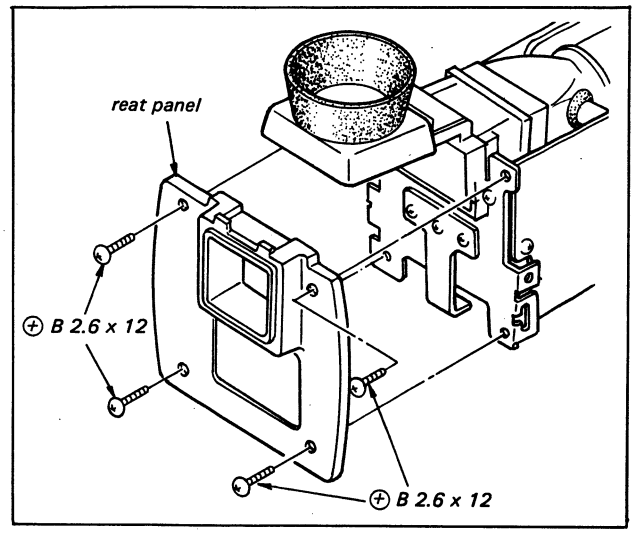


Fig. 3-7. Rear panel removal

3-8. VF LENS ASS'Y REMOVAL

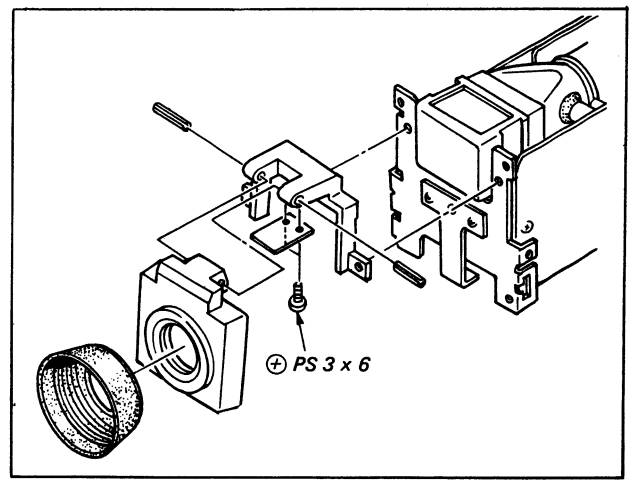


Fig. 3-8. VF lens ass'y removal

3-9. LENS MOUNT REMOVAL

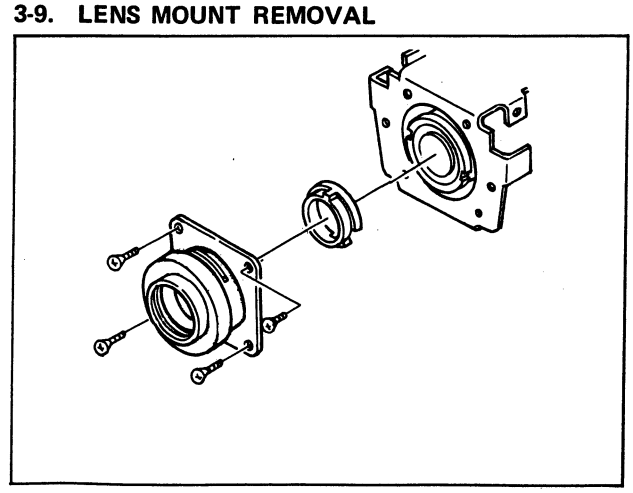


Fig. 3-9. Lens mount removal

SECTION 4
MAINTENANCE

4-1. PRECAUTIONS

The following precautions should be observed to prevent damage to the vidicon.

1. Do not jar the camera. Avoid handling the camera with the vidicon faceplate pointed downward.
2. Before applying the power to a defective camera in unknown condition, turn the beam control (VR104 VFF Board) fully clockwise. The vidicon may be damaged if power is applied in the absence of deflection signals.

4-2. EQUIPMENT REQUIRED

1. VOM (20 kΩ/V).
2. Oscilloscope : single trace : 3 MHz
3. Videocorder such as AV-3450CE
   (CMA-3CE is required when deck type videocorder such as AV-3620CE is used.)
4. Lighting system : Two pieces of 100 W lamp
5. Test pattern : SONY Part No. 3-701-397-00
6. B/W monitor TV : None specified
7. Frequency counter : 4-digit
8. Tripod or proper pedestal
9. Zoom lens VCL-1206 supplied with the equipment.

4-3. VIDICON REPLACEMENT

To remove the vidicon, proceed as follows.

1. Remove the lens by turning it fully counterclockwise.
2. Remove the top, front and bottom covers following the procedures given in section 3-1, 3-2 and 3-6.
3. Remove the lens mount by unscrewing the four screws following the procedures given in section 3-9.
4. Insert the tip of a screwdriver into any of the openings around the vidicon target ring and pry the vidicon forward. See Fig. 4-1.

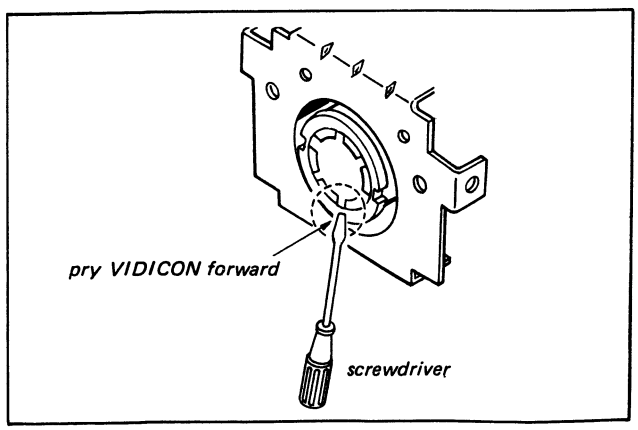


Fig. 4-1. Vidicon replacement

5. Inspect the replacemnet vidicon for scratches on the faceplate. Vidicon pins should be straight.
6. Hold the vidicon with the index pin at the 3 o'clock position as viewed from the rear. See Fig. 4-2. Insert the replacement vidicon straight in through the front of the camera. Slide it back as far as it will go.

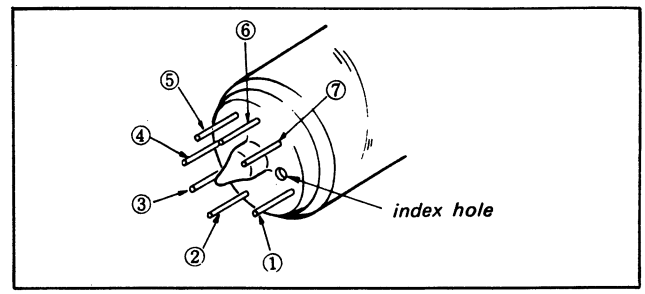


Fig. 4-2. Vidicon index pin

7. Install the vidicon socket (on the HVF Board) onto the vidicon.Grasp the HVF Board at the tabs.
8. Perform the adjustments described in following sections.

4-4. VIDICON ADJUSTMENTS

1. Deflection checks
   This step may be disregarded if the deflection circuits of the camera are known to be operating properly. If the condition of the deflection circuits is unknown, check the deflection waveforms shown in Fig. 4-3 before the vidicon socket is installed. If normal waveforms are observed, turn off the camera and push the socket onto the vidicon

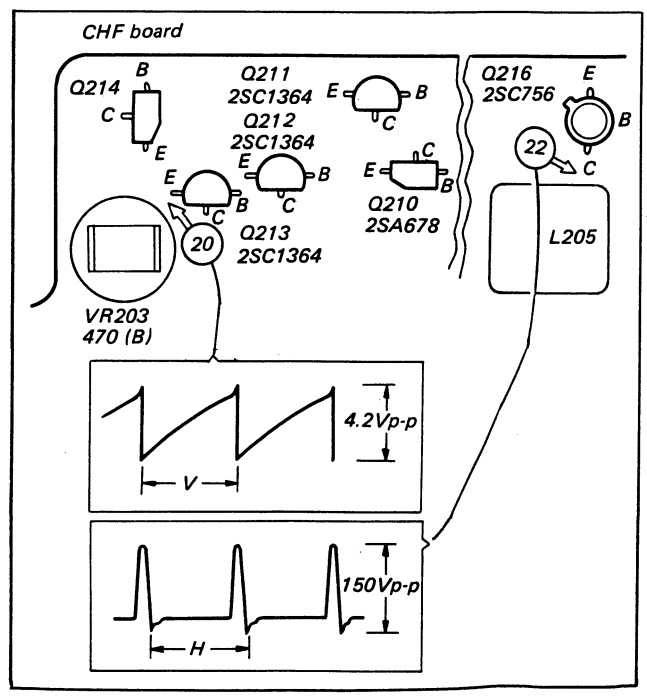


Fig. 4-3. Waveform checks

2. Vidicon high voltage check
Check the dc voltages at each vidicon electrode. See Fig. 4-4.

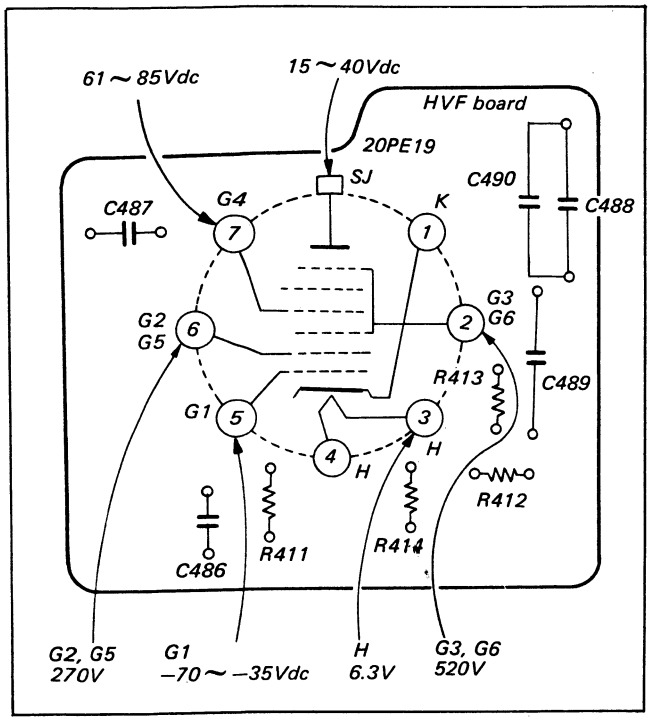


Fig. 4-4. Vidicon electrode voltage check

4-5. OPTICAL FOCUS ADJUSTMENT

1. Connect the camera to the portable videocorder and monitor TV to the Video Output terminal of the videocorder.
2. Turn on the camera and point it at an object farther than 10 meters (33 ft) away.
3. Set the lens to infinity, zoom up to the TELE position and open the iris fully. Adjust the optical lens focus ring for the sharpest possible focus.
4. Set the zoom to the wide-angle position. Place the tip of a screw driver into the slit, and turn the screwdriver back and forth of obtain optimum focus on monitor screen.

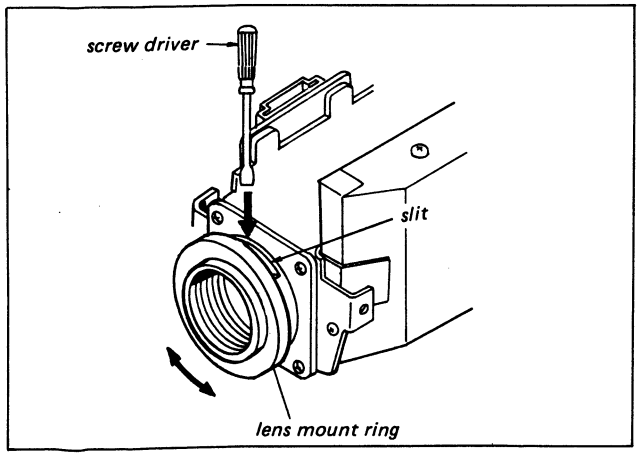


Fig. 4-5. Optical focus adjustment

5. Set the lens zoom control to the tele position and check focus; it should track throughout the entire zoom range. If focus still does not track correctly, repeat steps 2 to 4 two or three times.

4-6. PRELIMINARY SETUP

Test Jig (Standard Alignment Setup)
A test jig for use with the AVC-3450CE camera should be made up as follows.

1. Camera Mounting :
Use a tripod or proper pedestal.
2. Test Pattern mounted on board :
Suggested SONY test pattern 180 x 240 mm
(Part No. 3-701-397-00)
3. Lens :
Zoom lens model VCL-1206 that is supplied with equipment.
4. Proper illumination for test pattern :
The test pattern should be lighted so that all parts of the pattern have the same amount of light. Two 100-watt lamps placed in reflectors and positioned approximately 50 cm from the pattern will provide adequate lighting.
5. The distance between the test pattern and lens mounting ring must be precise, to properly fill the vidicon target. The distance can be determined by the test pattern height and focal length of the lens using the following equation.

$$\text{Subject distance (mm)} = \frac{f\,(h + 6.3)}{6.3} + \frac{f\,(h + 6.3)}{h} - 17.526$$

f : lens focal length in mm
h : test pattern height in mm

In the case where the height of the test pattern is 180 mm and lens focal length is 75 mm the correct distance is 227 cm.

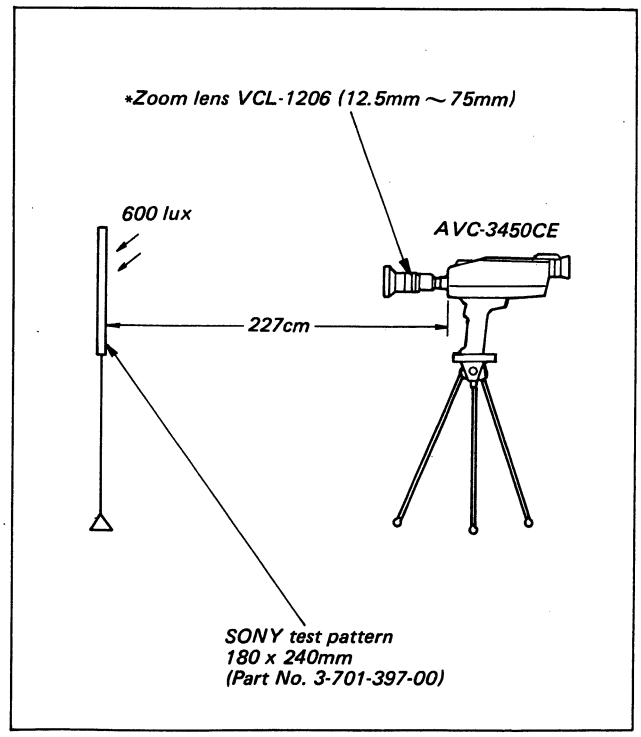


Fig. 4-6. Preliminary setup

Monitor and Videocorder Connections

It is necessary to connect a monitor and a videocorder when making adjustments on the camera. A convenient way to connect the camera to the monitor is shown in Fig. 4-7 and Fig. 4-8.

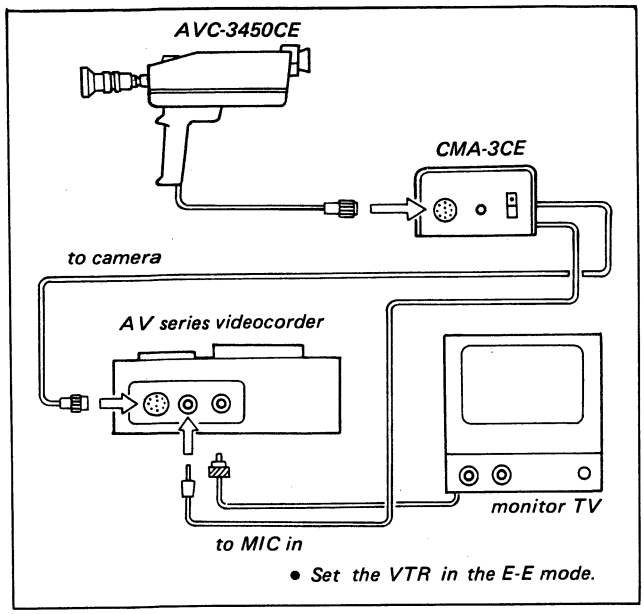


Fig. 4-7. Monitor connection with CMA-3CE

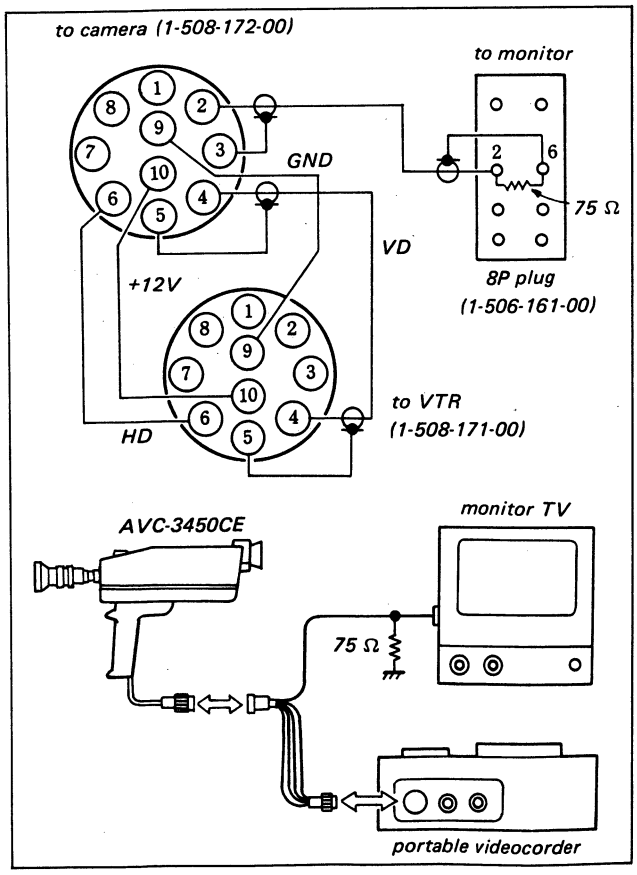


Fig. 4-8. Monitor connection

4-7. ADJUSTMENT PROCEDURE

4-8. POWER SUPPLY ADJUSTMENT

4-9. DEFLECTION SYSTEM ADJUSTMENT

- 4-9-1. Horizontal Oscillator Free-running Frequency
- 4-9-2. Horizotnal pulse width
- 4-9-3. Vertical Oscillator Frequency Confirmation
- 4-9-4. Vertical Pulse Width
- 4-9-5. Sync Level
- 4-9-6. Vertical & Horizontal Lineality, centering, width
- 4-9-7. Alignment magnet

4-10. VIDEO SYSTEM ADJUSTMENT

- 4-10-1. Preliminary
- 4-10-2. Pedestal Level
- 4-10-3. ASC Check
- 4-10-4. Target Voltage
- 4-10-5. Video Level
- 4-10-6. Beam and White Clip Level

4-11. VIEWFINDER ADJUSTMENT

- 4-11-1. Vertical and Horizontal Size
- 4-11-2. Deflection Yoke Tilt
- 4-11-3. Centering

4-8. POWER SUPPLY ADJUSTMENT

Check B+ 9 V before making any adjustments.

Connect the VOM to junction ② on the CHF Board (Q601 emitter lead wire) and adjust VR-206 (+9 V ADJ) for 9.0 ±0.1 Vdc.

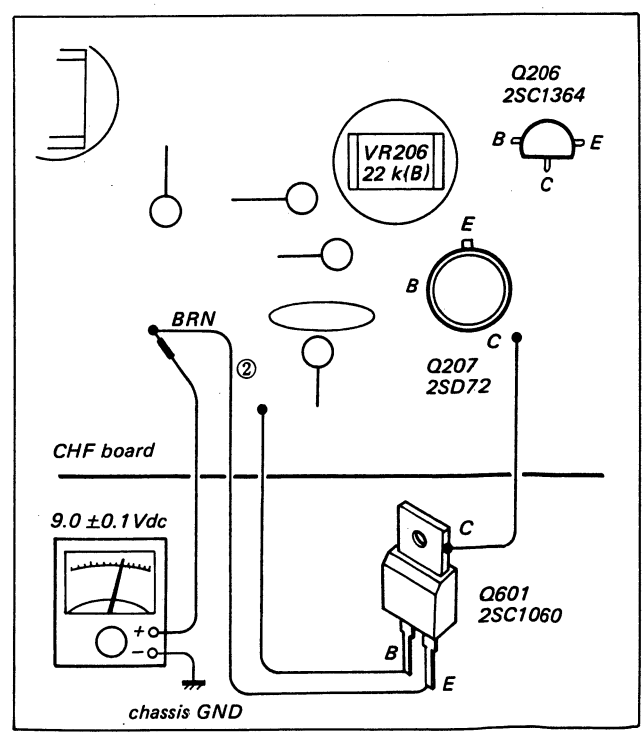


Fig. 4-9. Power supply adjustment

4-9. DEFLECTION SYSTEM ADJUSTMENT

4-9-1. Horizontal Oscillator Free-running Frequency

A. FACTORY SERVICE

1. Ground the pin ⑦ of connector CN201 using an extra lead wire.
2. Connect a frequency counter to the emitter of Q209 on the CHF board.
3. Adjust VR207 for 14,500 ±100 Hz.
4. After adjustment, be sure to remove the lead wire which was connected in step 1.
5. After performing above steps, turn the CMA-3CE or videocorder power on and off to confirm a frequency lock to 15,625 Hz.

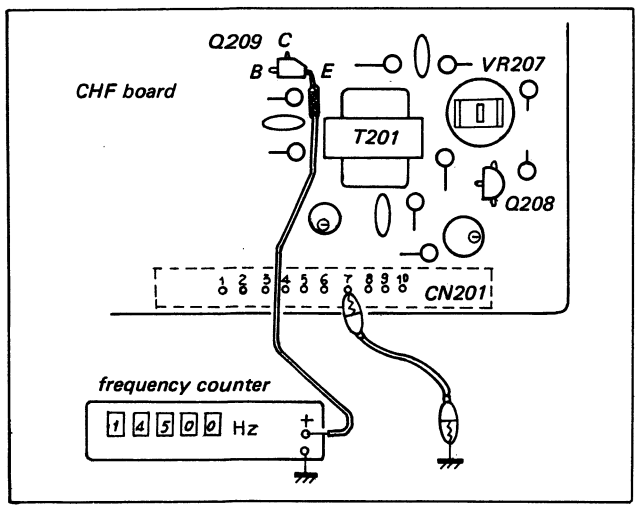


Fig. 4-10. Horizontal oscillator free-running frequency

B. FIELD SERVICE

1. Ground the pin ⑦ of connector CN201 using an extra lead wire.
2. Connect the calibrated oscilloscope to the emitter of Q209 on the CHF board.
3. Adjust VR207 for 69 ±0.5 μs, as shown in Fig. 4-11.
4. After adjustment, be sure to remove the lead wire which was connected in step 1.
5. After performing above steps, turn the CMA-3CE or videocorder power on and off to confirm a frequency lock of 64 μs.

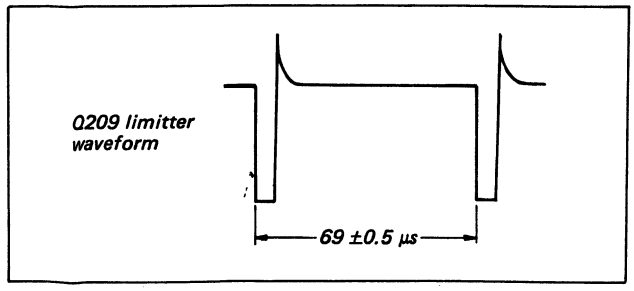


Fig. 4-11. Horizontal oscillator free-running frequency

4-9-2. Horizotnal Pulse Width Adjustment

Connect the oscilloscope to pin ② of connector CN201 and adjust VR210 (H. FRONT PORCH) to obtain the correct front porch and VR208 to obtain the correct blanking pulse width. See Fig. 4-12.

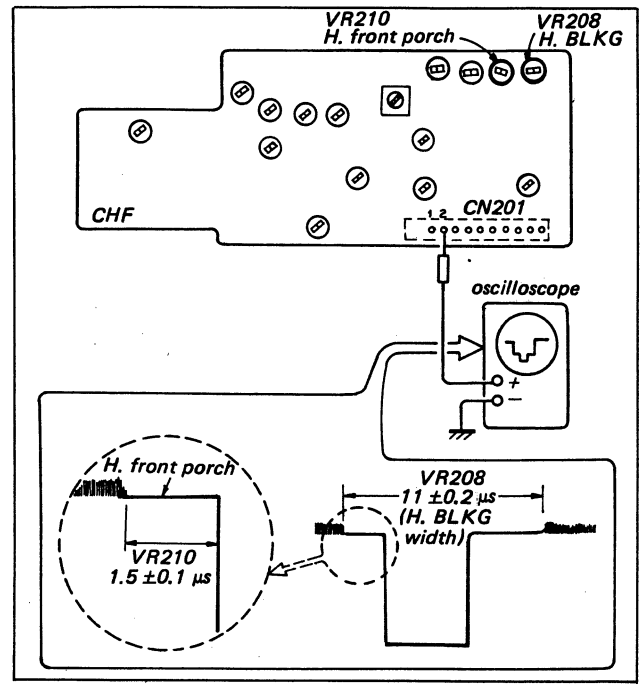


Fig. 4-12. Horizontal pulse width

4-9-3. Vertical Oscillator Frequency Confirmation

A. FACTORY SERVICE

1. Ground the pin ⑥ of connector CN201 on the CHF board using an extra lead wire.
2. Connect the frequency counter at pin ⑳ of IC202 and confirm that a frequency reading is 40 ±3 Hz.
3. Remove the wire between pin ⑥ and ground and confirm vertical frequency lock to 50 Hz.

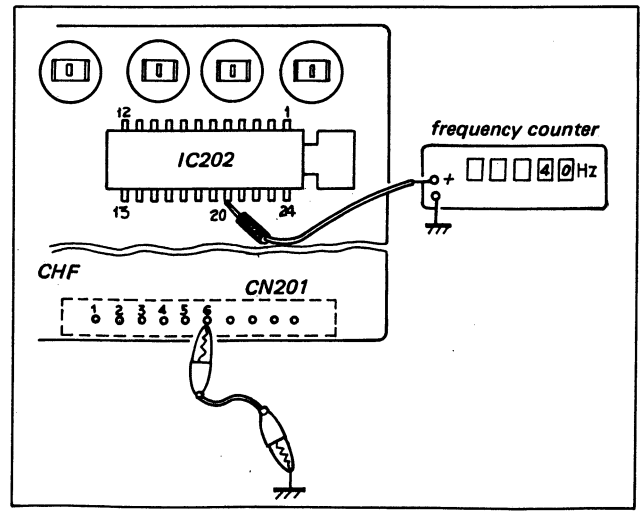


Fig. 4-13. Vertical oscillator frequency confirmation

B. FIELD SERVICE

1. Ground the pin ⑥ of connector CN201 on the CHF board using an extra lead wire.
2. Connect the calibrated oscilloscope at pin ⑳ of IC202 and confirm that a time reading is between 23 ~ 27 ms.

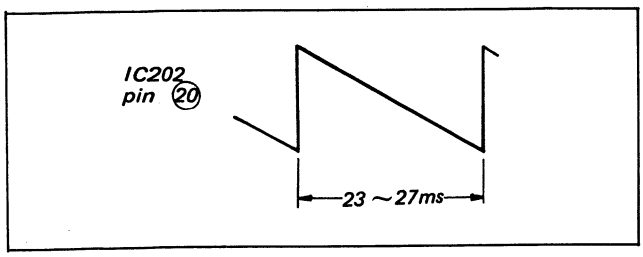


Fig. 4-14. Vertical oscillator frequency confirmation

3. Remove the wire between pin ⑥ and ground and confirm that vertical locks are 20 ms.

4-9-4. Vertical Pulse Width

Connect the oscilloscope at pin ② of connector CN201 and adjust VR211 to obtain correct front porch and adjust VR209 to obtain the correct blanking width.

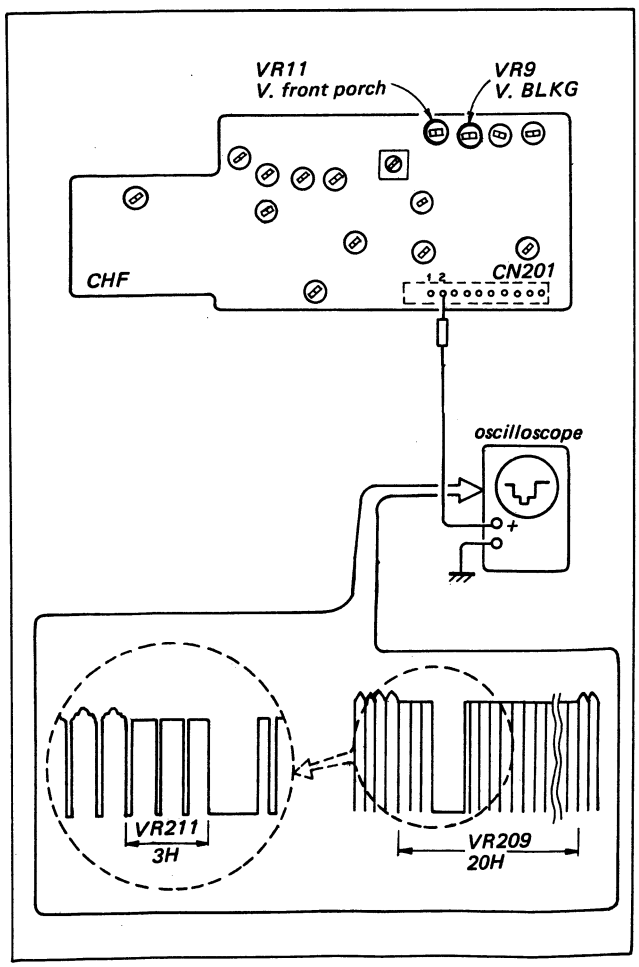


Fig. 4-15. Vertical pulse width

4-9-5. Sync Level

Connect the scope at pin ② of connector CN201 (See Fig. 4-15) and confirm that the sync level is 0.3 V ±0.03 V. If it is out of specification, substitute R266 on the CHF board with a resistor of between 470 to 2200 ohms.

4-9-6. Vertical & Horizontal Linearity, Centering, Width

This adjustment should be performed at Factory Service Center under standard operating conditions.

1. Set up the camera for standard operating conditions (See Fig. 4-6).
2. Set the alignment magnet for minimum magnetic field as shown below.

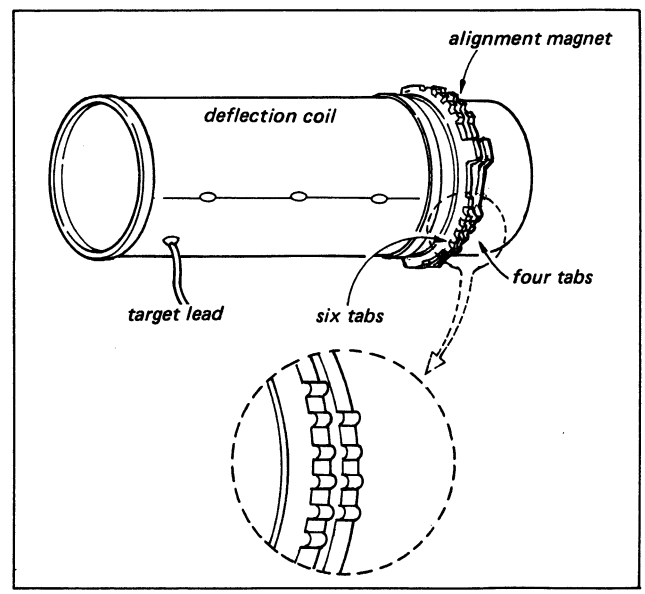


Fig. 4-16. Vertical & horizontal linearity, centering width

3. Increase deflection size by adjusting VR213 (V. LINE), L201 (H. SIZE) and VR212 (V. SIZE).
4. Adjust VR214 (V. CENT) and VR215 (H. CENT) so that the vidicon target ring is visible equally on all corners of the monitor screen.

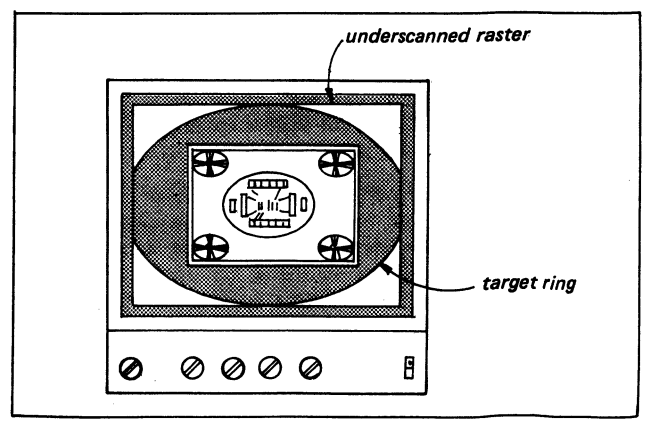


Fig. 4-17.

5. Adjust VR213 (V. LINE), L201 (H. SIZE), and VR212 (V. SIZE) to fill the screen with the test pattern.

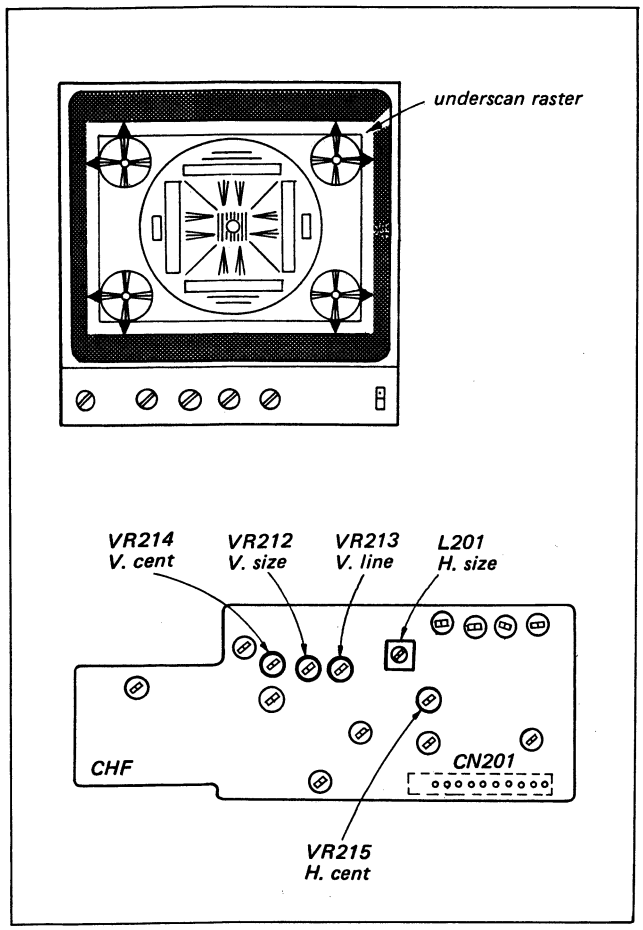


Fig. 4-18.

4-9-7. Alignment Magnet

For beam alignment, the vidicon uses a pair of permanent magnets mounted on the back of the coil assembly.

To check beam alignment, rotate electrical focus control VR-103 on the VFF Board and watch the monitor screen. The picture should appear to rotate about the center of the screen. If the picture center shifts to the side or up or down as focus is turned, the alignment magnet should be adjusted. Proceed as follows:

1. Bring the tabs together and rotate the entire assembly. Adjust the focus until the picture appears to rotate around a point in the center of the screen.
2. After the above procedure, if the picture center shifts to the side or up or down as focus is adjusted, spread the tabs slightly and rotate the entire assembly again. Repeat this procedure (changing the spread of the tabs) until the best beam alignment is obtained (picture center remains in the screen center as focus is adjusted).

Note: Picture centering, size, and linearity should be readjusted whenever the alignment magnets have been adjusted: Repeat the procedure in section 4-9-6.

4-10. VIDEO SYSTEM

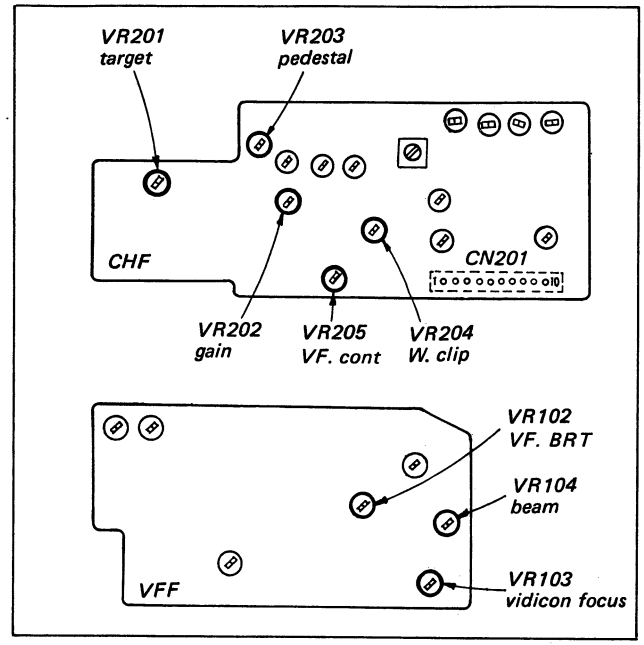


Fig. 4-19. Video system adjusting point

4-10-1. Preliminary

*If normal picture appear, preliminary is not necessarily.

Before adjustment, set VR-204 (WHT CLIP) to the fully clockwise position.

1. Target Voltage
   Turn VR-201 on the CHF Board fully counterclockwise and then turn it about one third to the right.
2. Beam
   Set VR-104 to obtain a normal picture on the monitor.
3. Focus
   Rotate the lens focus control for best focus and adjust VR-103 for best resolution.
4. Viewfinder Picture Confirmation
   Adjust VR-102 on the VFF board to obtain suitable contrast.

   Adjust contrast and focus with VR-201 and VR-205, respectively.

4-10-2. Pedestal Level

1. Connect the oscilloscope to pin ② of connector CN201.
2. Turn VR201 (TARGET) on the CHF board fully counter-clockwise, and make sure that no video component is outputted on scope. After the above procedure, set VR203 (PEDESTAL) to obtain 20～30 mV of the pedestal.

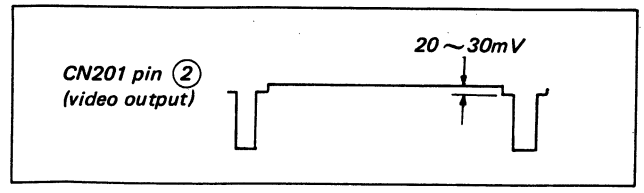


Fig. 4-20. Pedestal level

3. Restore the VR201 (TARGET) about one third to the right, and make sure that the video portion about 0.7 V. If it does not show up, adjust VR202 (GAIN) on the CHF board to obtain 0.7 V of the video segment.

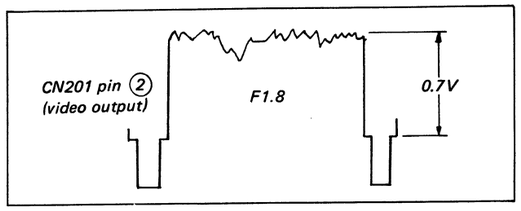


Fig. 4-21.

4-10-3. A.S.C. Check

1. Set the lens iris to F1.8 under normal operating conditions.
2. Adjust VR-201 until the video signal no longer increases.
3. Reset the lens iris to F16 In 5 to 6 seconds, turn the lens iris to F1.8 quickly, to confirm that the video level has stabilized on the screen.

4-10-4. Target Voltage

1. Set the lens iris to F5.6 under normal operating conditions.
2. Connect thd oscilloscope to pin (2) of connector CN-201 of the CHF board. See Fig. 4-19.
3. Adjust VR-201 for a voltage reading of 0.35 ±0.03 Vdc for the video portion. See Fig. 4-22.

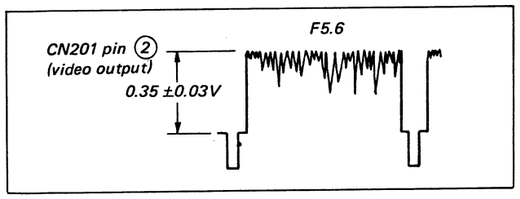


Fig. 4-22.

4-10-5. Video Level

1. Set the lens iris to F1.8 under normal operating conditions.
2. Connect the oscilloscope to pin (2) of connector CN-201 on the CHF board. See Fig. 4-19.
3. Adjust VR-202 for a video level reading of 0.7 ±0.03 V. See Fig. 4-23.
4. After adjustment re-confirm the voltage level of section 4-10-4.

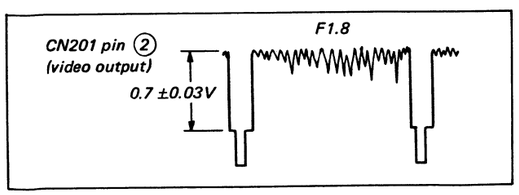


Fig. 4-23. Video level

4-10-6. Beam and White Clip Level

1. Connect the oscilloscope to pin (2) of connector CN201 on the CHF board.
2. Turn VR204 (WHT CLIP) on the CHF board fully clockwise.
3. Pan the camera at a high contrast object such as fluorescent lights and adjust VR104 (BEAM) to obtain 1.4 ±0.1 V(p-p). See Fig. 4-24.

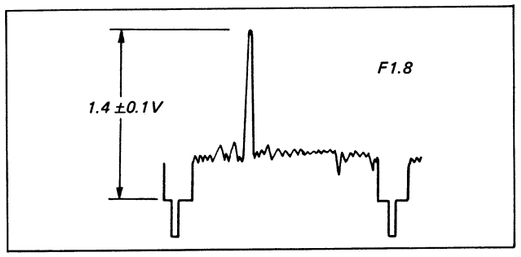


Fig. 4-24. Beam adjustment

4. Adjust VR-204 to obtain a white clip voltage of 1.0 +0, −0.1 V(p-p).

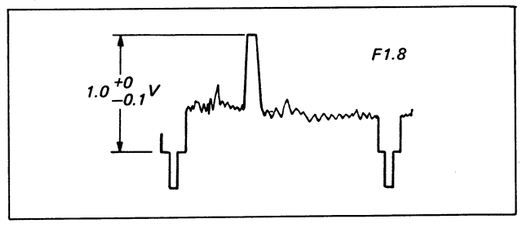


Fig. 4-25. White clip adjustment

4-11. VIEWFINDER ADJUSTMENT

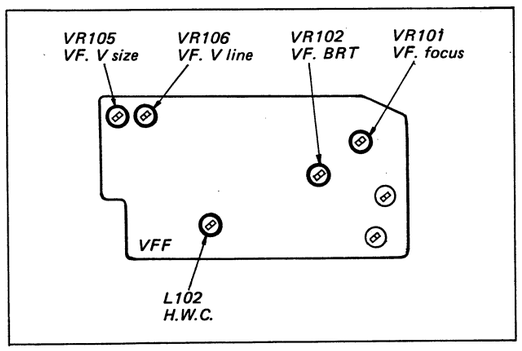


Fig. 4-26. VF system adjusting point

4-11-1. Horizontal and Vertical Size Adjustment

1. Set up the normal operating condition. Refer to section 4-6.
2. Increase brightness to a suitable level by adjusting VR-102. Adjust focus control VR-101 on the VFF board.

3. Adjust horizontal size with L102 on the VFF board, vertical linearity with VR-106, and vertical size with VR-105 to obtain the test pattern shown in Fig. 4-27. The four small circles must appear in the corners of the test pattern picture as shown.

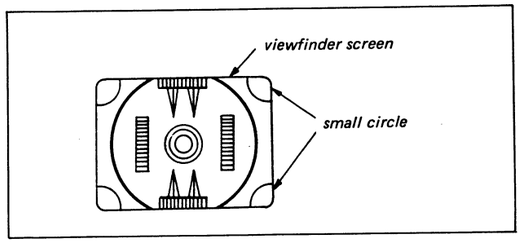


Fig. 4-27. H.V size adjustment

4-11-2. Deflection Yoke Tilt Adjustment

1. Set the vertical size to underscan using VR-106 on the VFF board. If the upper edge of the raster is tilted, loosen the DY mounting screw and rotate the deflection yoke.

4-11-3. Centering Adjustment

If necessary, adjust horizontal and vertical centering using the centering magnet. See Fig. 4-28.

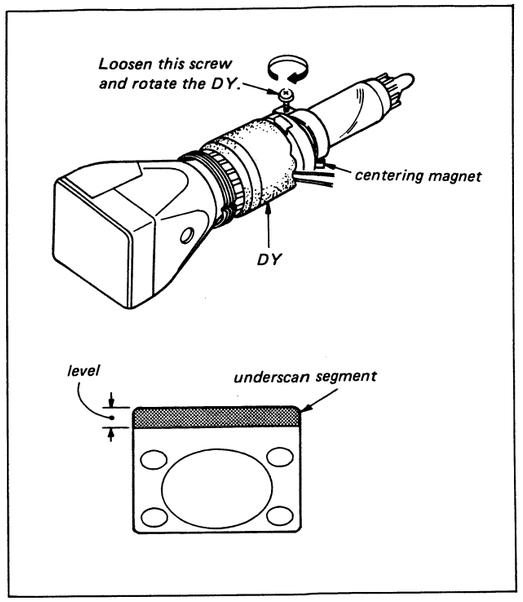
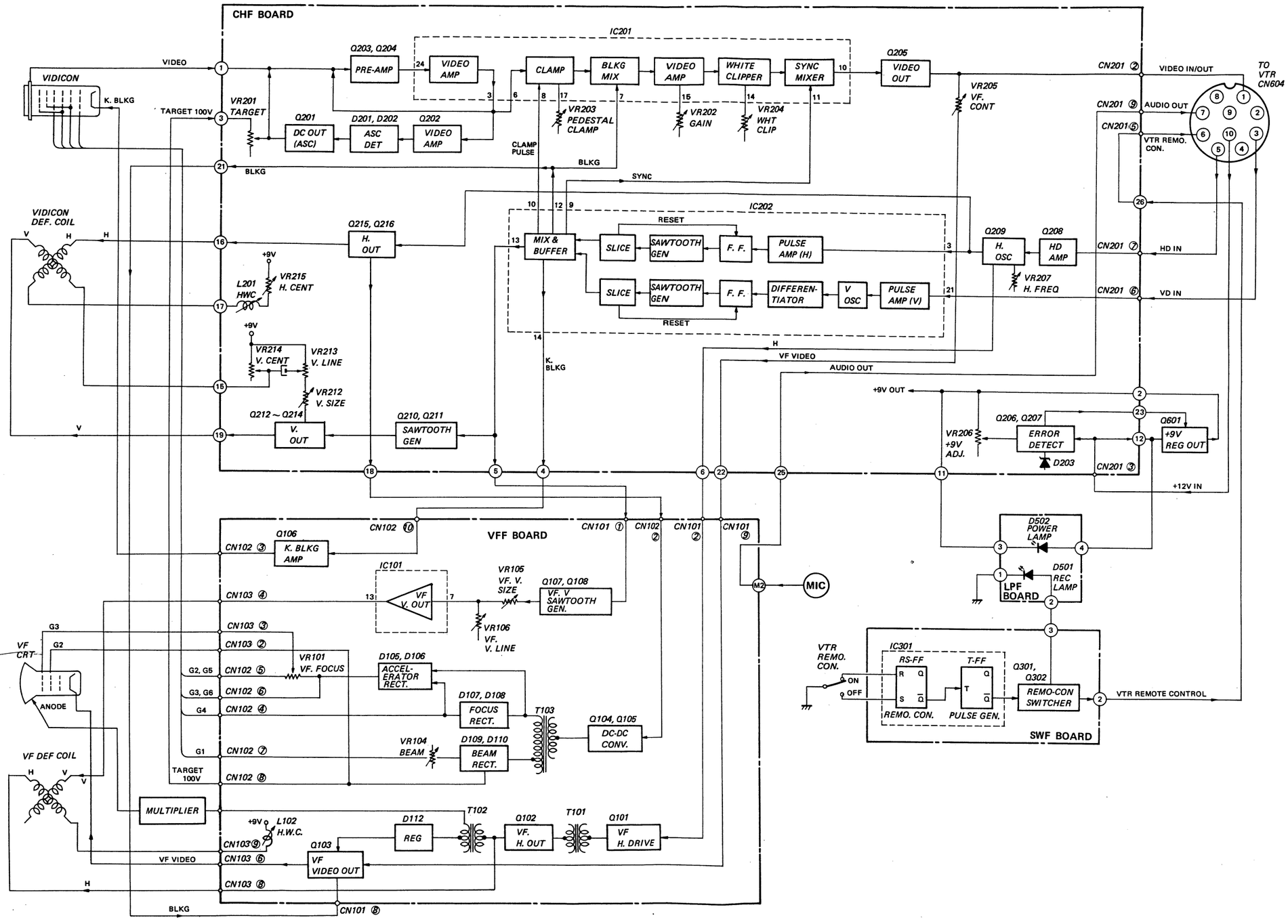


Fig. 4-28. DY tilt adjustment

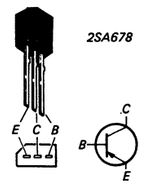
SECTION 5
PRINTED CIRCUIT BOARD AND SCHEMATIC DIAGRAMS

BLOCK DIAGRAM

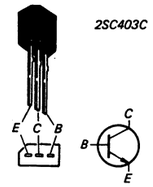


SEMICONDUCTORS

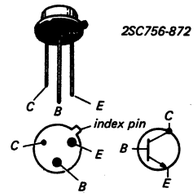
2SA678



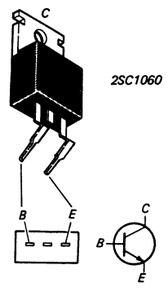
2SC403C



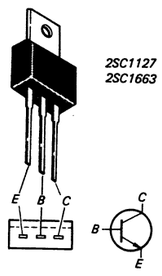
2SC756-872



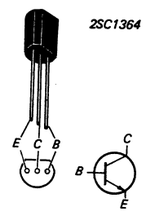
2SC1060



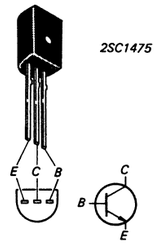
2SC1127
2SC1663



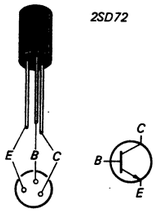
2SC1364



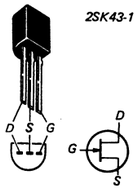
2SC1475



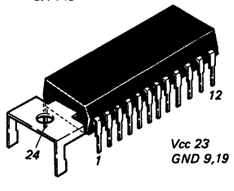
2SD72



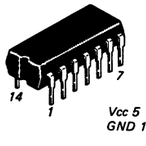
2SK43-1



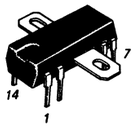
CX-148
CX-149



M-53200P



TP-7093P



WAVEFORMS

① 3Vp-p, H

② 140Vp-p, H

③ 1Vp-p, H

④ 8Vp-p, H

⑤ 20Vp-p, 2H

⑥ 28Vp-p, V

⑧ 2.3Vp-p, V

⑨ 1.3Vp-p, V

⑩ 6Vp-p, V

⑪ 1.0Vp-p, V

⑫ 6.5Vp-p, H

⑬ 8.0Vp-p, H

⑭ 8.0Vp-p, H

⑮ 1.5Vp-p, H

⑯ 13Vp-p, H

⑰ 14Vp-p, H

⑱ 14Vp-p, V

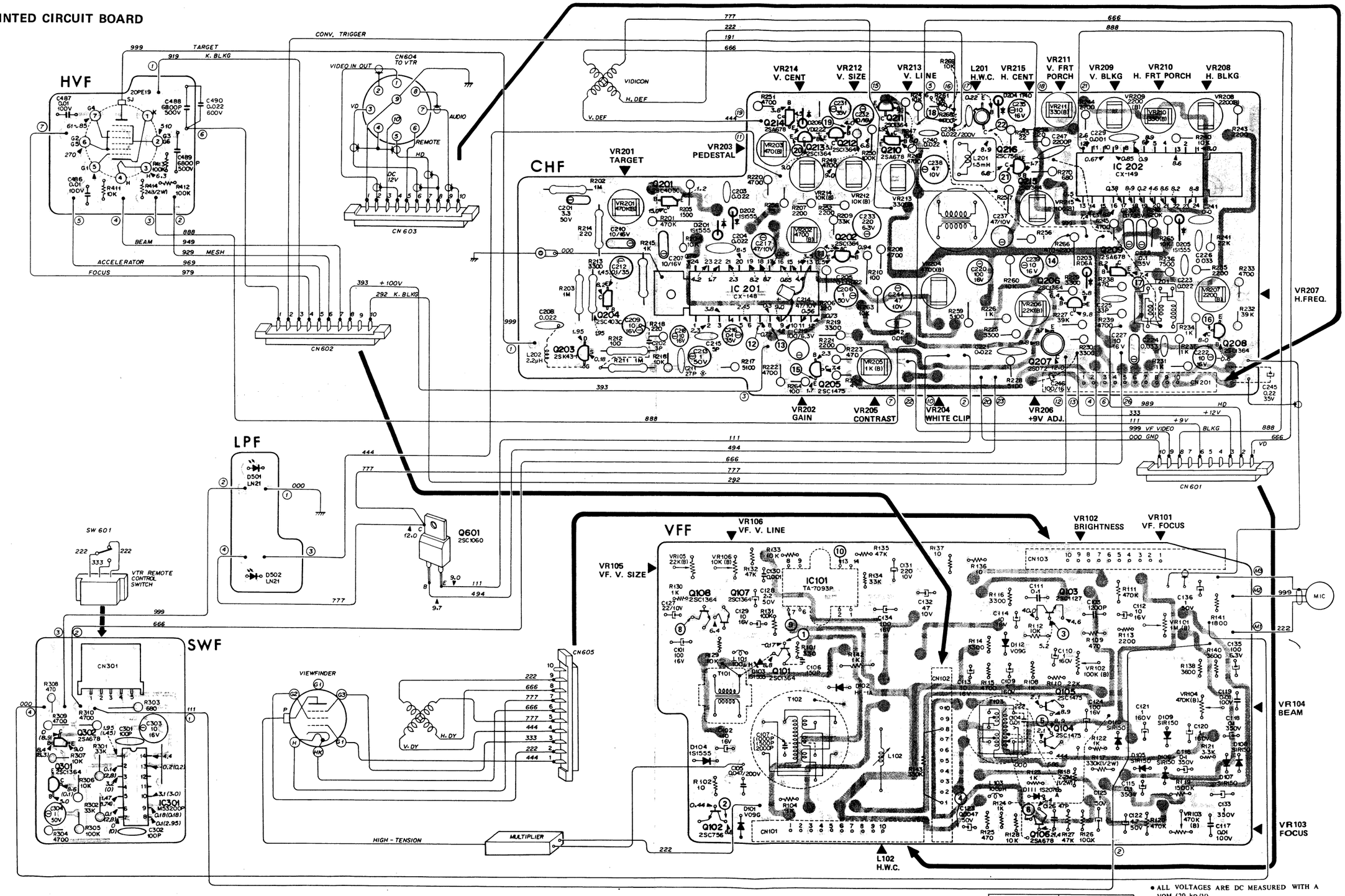
⑲ 4.3Vp-p, V

⑳ 4.2Vp-p, V

㉑ 8Vp-p, H

㉒ 150Vp-p, H

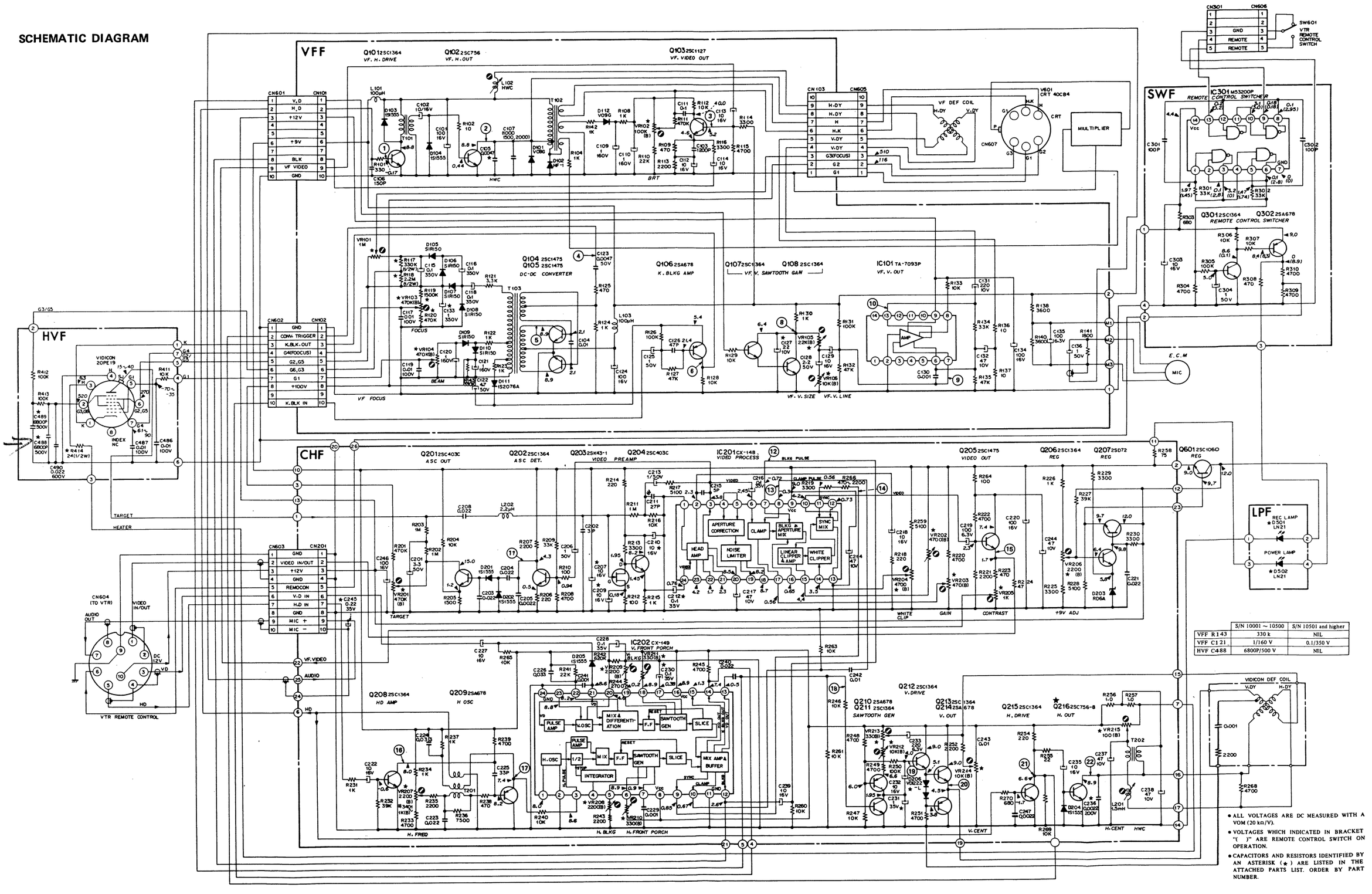
PRINTED CIRCUIT BOARD



	S/N 10001 ~ 10500	S/N 10501 and higher
VFF R143	330 k	NIL
VFF C121	1/160 V	0.1/350 V
HVF C488	6800P/500 V	NIL

- ALL VOLTAGES ARE DC MEASURED WITH A VOM (20 kΩ/V).
- VOLTAGES WHICH INDICATED IN BRACKET "( )" ARE REMOTE CONTROL SWITCH ON OPERATION.

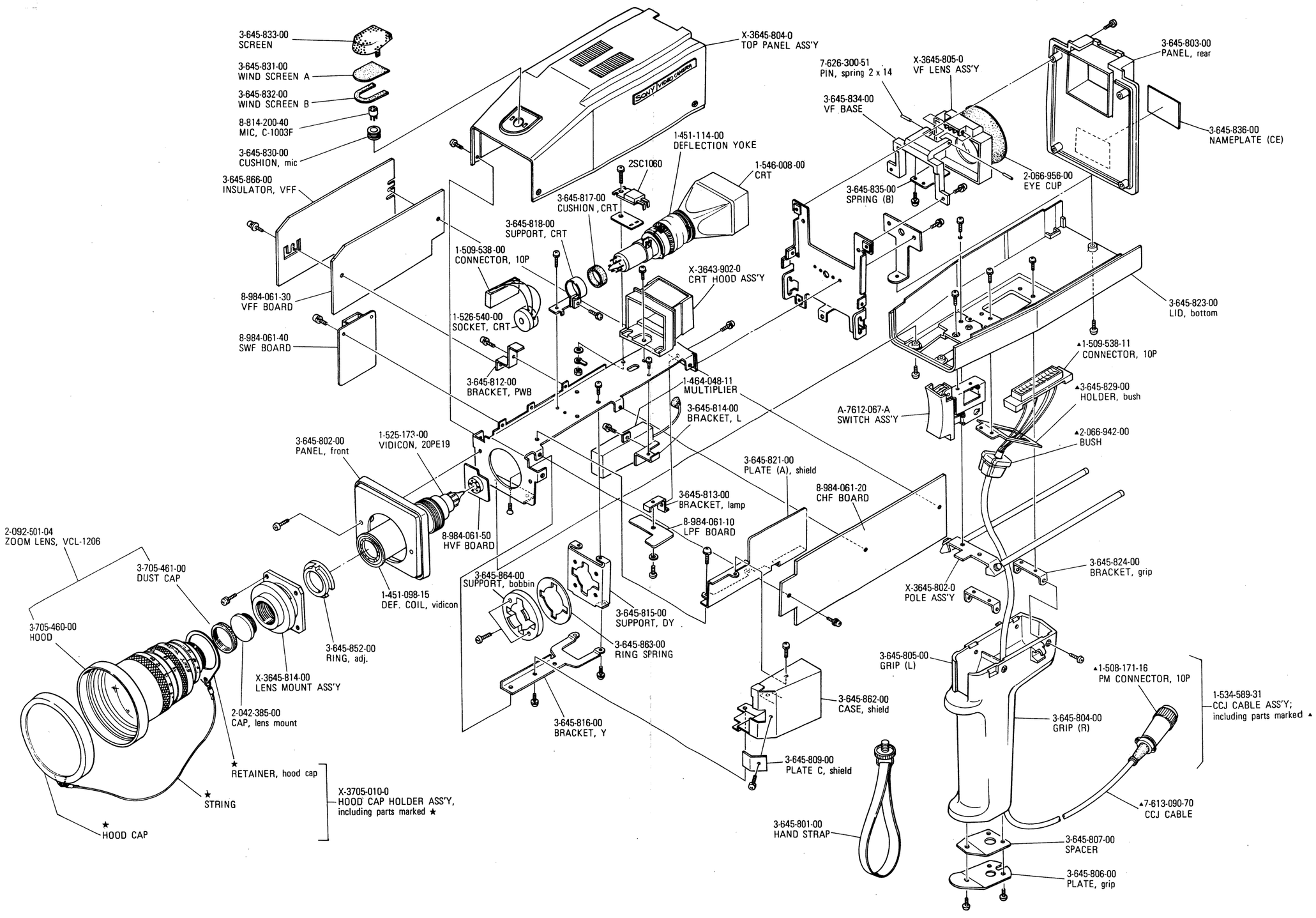
SCHEMATIC DIAGRAM


VFF
HVF
CHF
SWF
LPF
Q101 2SC1364 VF. H. DRIVE
Q102 2SC756 VF. H. OUT
Q103 2SC1127 VF. VIDEO OUT
Q104 2SC1475 Q105 2SC1475 DC-DC CONVERTER
Q106 2SA678 K. BLKG AMP
Q107 2SC1364 VF. V. SAWTOOTH GAN
Q108 2SC1364
IC101 TA-7093P VF. V. OUT
Q201 2SC403C ASC OUT
Q202 2SC1364 ASC DET.
Q203 2SK43-1 VIDEO PREAMP
Q204 2SC403C
IC201 CX-148 VIDEO PROCESS
Q205 2SC1475 VIDEO OUT
Q206 2SC1364 REG
Q207 2SD72 REG
Q601 2SC1060 REG
Q208 2SC1364 HD AMP
Q209 2SA678 H OSC
IC202 CX-149 V. FRONT PORCH
Q210 2SA678 Q211 2SC1364 SAWTOOTH GEN
Q212 2SC1364 V. DRIVE
Q213 2SC1364 Q214 2SA678 V. OUT
Q215 2SC1364 H. DRIVE
Q216 2SC756-8 H. OUT
IC301 M53200P REMOTE CONTROL SWITCHER
Q301 2SC1364 Q302 2SA678 REMOTE CONTROL SWITCHER
CN601 CN101 V.D H.D +12V +9V BLK VF VIDEO GND
CN602 CN102 GND CONV. TRIGGER K.BLK.OUT G4(FOCUS) G2,G5 G6,G3 G1 +100V K.BLK IN
CN603 CN201 GND VIDEO IN/OUT +12V GND REMOCON V.D IN H.D IN GND MIC + MIC −
CN604 (TO VTR) VIDEO IN/OUT AUDIO OUT DC 12V VD HD VTR REMOTE CONTROL
CN301 CN605 GND REMOTE REMOTE
SW601 VTR REMOTE CONTROL SWITCH
CN103 CN605 H.DY H.DY H V.DY V.DY G3(FOCUS) G2 G1
VF DEF COIL H.DY V.DY
V601 CRT 40CB4 CRT
CN607
MULTIPLIER
E.C.M MIC
VIDICON DEF. COIL V.DY H.DY
VIDICON 20PE19
INDEX NC
TARGET HEATER
FOCUS BEAM VF FOCUS
VF. V. SIZE VF. V. LINE
H. FRED H. BLKG H. FRONT PORCH
V. CENT H. CENT HWC
WHITE CLIP GAIN CONTRAST +9V ADJ
REC LAMP ★ D501 LN21
POWER LAMP ★ D502 LN21
APERTURE CORRECTION CLAMP BLKG APERTURE MIX SYNC MIX HEAD AMP NOISE LIMITER LINEAR CLIPPER & AMP WHITE CLIPPER
PULSE AMP MIX & DIFFERENTIATION F.F SAWTOOTH GEN SLICE H. OSC 1/2 MIX INTEGRATOR MIX AMP & BUFFER V. OSC
AMP

	S/N 10001 ~ 10500	S/N 10501 and higher
VFF R143	330 k	NIL
VFF C121	1/160 V	0.1/350 V
HVF C488	6800P/500 V	NIL

- ALL VOLTAGES ARE DC MEASURED WITH A VOM (20 kΩ/V).
- VOLTAGES WHICH INDICATED IN BRACKET "( )" ARE REMOTE CONTROL SWITCH ON OPERATION.
- CAPACITORS AND RESISTORS IDENTIFIED BY AN ASTERISK (★) ARE LISTED IN THE ATTACHED PARTS LIST. ORDER BY PART NUMBER.

SECTION 6
EXPLODED VIEW WITH PARTS NUMBER



ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
		ELECTRICAL PARTS
		Mounted Boards
A-7511-074-A	(8-984-061-10)	LPF Board -------
A-7511-076-A	(8-984-061-20)	CHF Board -------
A-7511-077-A	(8-984-061-30)	VFF Board -------
A-7511-078-A	(8-984-061-40)	SWF Board -------
A-7511-075-A	(8-984-061-50)	HVF Board -------
		Capacitors
		Standard electrolytic and mylar capacitors (less than 200 WV) and ceramic capacitors (less than 50 WV) are not listed.
		All capacitors are in micro farads unless otherwise indicated.
		VFF Board
C105	1-105-749-12	mylar 0.0047 200 V --
C127	1-131-231-51	tantal 22 10 V --
		CHF Board
C207	1-131-199-11	tantal 10 16 V --
C209	1-131-199-11	tantal 10 16 V --
C210	1-131-199-11	tantal 10 16 V --
C212	1-131-209-11	tantal 0.1 35 V --
C216	1-131-209-11	tantal 0.1 35 V --
C228	1-131-209-11	tantal 0.1 35 V --
C230	1-131-209-11	tantal 0.1 35 V --
C231	1-131-215-11	tantal 1 35 V --
C245	1-131-211-11	tantal 0.22 35 V --
		Connectors
CN101 ≀ CN103	1-509-537-00	10P (VFF Board) -------
CN201	1-509-537-00	10P (CHF Board) -------
CN301	1-509-635-00	5P (SWF Board) --------
CN601 ≀ CN603	1-509-538-00	10P (Frame) ----------
CN604	1-508-171-00	PM Connector ---------
CN605	1-509-538-00	10P (Frame) ----------
CN606	1-508-670-00	5P (male) ----------
CN607	1-526-540-00	Socket, CRT ----------

Ref. No.	Part No.	Description
		Diodes
		VFF Board
D101		V09G ----------
D102		HF-1 ----------
D103,104		1S1555 ----------
D105 ≀ D110		S1R150 ----------
D111		1S2076A ----------
D112		V09G ----------
		CHF Board
D201,202		1S1555 ----------
D203		RD6A ----------
D204,205		1S1555 ----------
D206		VD1222-L ----------
		LPF Board
D1,2		LN21 ----------
		IC
		VFF Board
IC101		TA7093P ----------
		CHF Board
IC201		CX-148 ----------
IC202		CX-149 ----------
		SWF Board
IC301		M53200P ----------
		Inductors
		VFF Board
L101	1-407-169-00	100 μH ----------
L102	1-459-131-00	VF. HWC ----------
L103	1-407-169-00	100 μH ----------
		CHF Board
L201	1-407-834-00	VIDICON HWC --------
L202	1-407-182-00	micro 2.2 μH --------

Ref. No.	Part No.	Description
		Transistors
		VFF Board
Q101		2SC1364
Q102	8-727-587-20	2SC756-872
Q103		2SC1127
Q104,105		2SC1475
Q106		2SA678
Q107,108		2SC1364
		CHF Board
Q201		2SC403C
Q202		2SC1364
Q203	8-723-302-00	2SK43-1
Q204		2SC403C
Q205		2SC1475
Q206		2SC1364
Q207		2SD72
Q208		2SC1364
Q209,210		2SA678
Q211		
≀		2SC1364
Q213		
Q214		2SA678
Q215		2SC1364
Q216	8-727-587-20	2SC756-872
		SWF Board
Q301		2SC1364
Q302		2SA678
		Resistors

Carbon resistors in ohm 1/2 W, 1/4 W, ±5% are omitted.

		VFF Board		
R117	1-202-633-11	Compo	330 k	
R118	1-202-653-11	Compo	2.2 MΩ	
R119	1-213-188-11	metal	1500 k	
R120	1-213-187-11	metal	470 k	
		HVF Board		
R414	1-202-534-11	Compo	24	1/2 W

Ref. No.	Part No.	Description
		Variable Resistors
		VFF Board
VR101	1-222-846-00	1 M
VR102	1-222-845-00	100 kB
VR103	1-224-134-00	470 kB
VR104	1-222-702-00	470 kB
VR105	1-221-979-00	22 kB
VR106	1-222-701-00	10 kB
		CHF Board
VR201	1-222-702-00	470 kB
VR202	1-221-978-00	4.7 kB
VR203	1-222-805-00	470 B
VR204	1-221-978-00	4.7 kB
VR205	1-222-804-00	1 kB
VR206		
≀	1-221-997-00	2.2 kB
VR209		
VR210	1-221-986-00	330 B
VR211	1-221-986-00	330 B
VR212	1-222-701-00	10 kB
VR213	1-221-986-00	330 B
VR214	1-222-701-00	10 kB
VR215	1-224-247-00	100 B
		Transformers
		VFF Board
T101	1-435-009-00	Trans, H blocking
T102	1-439-150-00	Trans, fly back
T103	1-442-429-00	Trans, convertor
		CHF Board
T201	1-435-010-00	Trans, H
T202	1-407-721-00	Trans, H CENT
		Miscellaneous
SW601	1-514-486-00	Switch, push button
V601	1-546-008-00	CRT
	1-451-098-15	Deflection Coil, vidicon
	1-451-098-23	Deflection Coil, vidicon
	1-451-114-00	Deflection Coil, CRT
	1-525-173-00	Vidicon, 20PE19
	1-526-519-00	Socket, vidicon
	1-507-109-00	Terminal, male
	1-508-171-16	Connector, 10P
	1-509-538-11	Connector, 10P
	1-534-589-31	CCJ Cable Ass'y
	1-534-645-61	Cord, microphone
	1-464-048-12	Multiplier
	8-814-200-40	Mic, C-1003F

ACCESSORY & PACKINGS

Part No.	Description
3-645-801-00	Hand Strap
3-645-859-00	Packing
3-645-857-03	Cushion, lens
3-645-860-00	Cushion
3-701-625-00	Bag, poly
3-701-632-00	Bag, poly
X-4490-002-2	Silicon Cloth Ass'y
3-780-540-12	Manual, Instruction
2-092-501-04	Zoom Lens, VCL-1206